

Record Request DTE-7 (Tr. 2, at 381)

Please provide a copy of the company's training requirements for in-house employees and contractors that perform work on the company's electric and/or gas distribution systems.

Response

Please find attached: (1) an Overview of NSTAR's Craft and Compliance Training protocols (see Attachment RR-DTE-7(a)); and (2) specific training requirements for NSTAR Electric in-house employees in various disciplines associated with the Company's overhead, underground, substation and dispatch facilities (see Attachment RR-DTE-7(b)).

With regard to outside contractors, NSTAR Electric enters into contracts only with experienced utility construction companies that have established reputations in the electric utility industry throughout New England. These companies are responsible to provide all applicable training for their employees, as defined by OSHA. These training programs include job apprentice training, in-house training, and formal educational training at community colleges. To the extent that NSTAR identifies performance issues with a contractor, NSTAR addresses these issues with the contracts, including, but not limited to, requiring the contractor to submit a corrective action plan to NSTAR, or be subjected to penalties and/or termination if the issue is not addressed to NSTAR's satisfaction. Based on NSTAR's experience, this approach has been successful in ensuring quality workmanship on the electric system. Therefore, it is unnecessary for the company to provide formal, in-house training for outside contractors. Moreover, cost considerations make it inappropriate for NSTAR to use NSTAR customer dollars to train outside contractors, who, in turn, may use NSTAR-related training to benefit non-NSTAR customers.

Overview of NSTAR's Craft & Compliance Training

Many standards promulgated by the Occupational Safety and Health Administration (OSHA) explicitly require the employer to train employees in the safety and health aspects of their jobs. Other OSHA standards make it the employer's responsibility to limit certain job assignments to employees who are "certified," "competent," or "qualified"-meaning that they have had special training, in or out of the workplace. The term "designated" personnel means selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

These requirements reflect NSTAR's belief that training is an essential part of every employer's safety and health program for protecting workers from injuries and illnesses.

NSTAR's Technical Training falls into one of the four categories below:

Craft Specific Apprentices Program: This is formal classroom and hands-on training given to each person that enters any job classification. This training consists of the skills required to perform their jobs safely. Once in the field, they will gradually gain more specific knowledge in the overall job classification. They then return to a formal classroom training program to reinforce and test this knowledge. All crafts have approx. a 3-4 year training program in which formal training and on the job training reinforcement are cycled to a pre-determined schedule. At the end of the specific craft time line, the person has reached the top level in that craft and is now capable to perform any function in that job classification. A person is considered an apprentice until they have reached the top job classification. This training is usually guided by an agreement between the company and the Local. In the Meter, UG, and Sub-station areas there are training Committee's which are comprised of both represented and non-represented employees that oversee the training programs.

Compliance: This is annual training that is required by OSHA, state or federal regulatory agencies. There are 8 -12 programs that require 10 - 40 hours of training per person per year that fall under this category depending on the craft.

Review (new tool/procedure) Training: Any time a new tool or procedure is introduced into the workplace that is significantly different a training program is initiated to assure consistency and safety across NSTAR. The trainers in each craft are involved in the evaluation and/or testing of any new tool or procedure that is introduced. This training is provided on an as-needed basis.

ERP Training: Approximately 1,000+ NSTAR employees are assigned a job function to help restore service ASAP after/during a storm. Some of this training is related to the employee's primary job classification. Some of this training is for non-traditional staff trained to participate in storm restoration in roles that are different from their everyday duties. For examples, Meter Readers are trained to provide stand-by support at downed electrical wires. Office personnel (clerical support, technical and financial professionals) are trained as Municipal Communicators to provide a direct communications link between NSTAR and municipal safety personnel. This training is provided annually to anyone who receives new or different assignment and as a refresher to those who have been previously trained.

NSTAR
Craft & Compliance
Annual Training Man-hours

The table below indicates average time spent annually in training for all employee in Gas or Electric Operations. Each employee spends approximately 46.4 hours in Compliance + Refresher/Ad-Hoc training per year.

In addition while in the structured apprenticeship program they spend an additional 100 – 640 annual hours in training depending on the craft/program they are in.

(These numbers do not include time spent in their monthly safety meetings).

Compliance Training = All Environmental; OSHA/State/Federal regulations such as

	Annual Compliance Training	Annual Refresher/ Ad-hoc	Columns 1 & 2	Apprenticeship Classroom Hours / year During Apr. Training	Length of Structured Apprenticeship Program
OH	20	40		100	4.5 Years
UG	20	30		280	2 Years
O&M	18	24		293	3 Years
DISP	10	16		480 Dist 640 System	1 Year 1 Year
METER	10	30		160	5 Years
GAS Op's	40	20		108	3 Years
AVERAGE	19.7	26.7	46.4		

1910.269; CPR/FA; Pole Top Rescue (OH); Manhole Rescue (UG); Fire School (O&M); DOT Pipeline part 192 & Operator Qualification (Gas Op's).

Refresher / AdHoc = New tools /equipment; new policy/procedure; Safety Training; Requests from supervisors/managers for certain programs.

Overhead Progression Classes

T1019 Grade C Qualification

6 weeks classroom 1 year Field

Grade "C" Apprentice Lineworker Qualification

SCOPE

1. This is a qualification program for lineworker grade "C". A candidate must demonstrate to the satisfaction of the line school staff, his or her ability to climb poles and an acceptable mechanical aptitude. Successful completion of the program qualifies the candidate as a lineworker grade "C".
2. The size of the class may vary from six to fourteen students.
3. Instruction will be given by the line school supervisors and a leader lineworker.

GENERAL

1. Arrangements for each class will be made by the Human Resources Department. Candidates will report to the line school supervisor at the Waltham Service Center, 200 Calvary Street, Waltham.
2. Candidates shall report to the line school wearing minimum 6" work boots with steel toes, a long sleeve shirt and loose fitting clothing.
3. Candidates shall bring their lunch.

QUALIFICATION

1. The decision to disqualify any candidate will be made by the line school supervisor.
2. When a candidate withdraws or is disqualified before completion of the course, the line school supervisor will inform the human resources department.

COURSE CONTENT

1. Introduction of all personnel. Make name tags for the table.
2. Brief outline of the course.
3. Thirty minute talk on company rules a new employee coming into the department should know.
4. Report all personal injuries to the Line School Supervisor immediately.
5. Issue hard hats and work gloves. Candidates names shall be printed on their hard hats front and rear.

6. Show film (Art of Climbing).
7. Issue gaffs to each applicant.
8. Adjust gaffs for proper fit, also issue 9" x 9" foam pads to keep legs from chaffing. (Basketball knee pads are excellent to prevent chaffing.)
9. Demonstrate how to walk with gaffs on and have the class practice.
10. Demonstrate and train how to keep gaffs at a 30 degree angle when starting to climb.
11. If three instructors are present, divide the class into 3 groups. Start 2 steps up using proper angle. This way each candidate will get individual attention until getting up to 10' and then each can take a pole.
12. The first day, climb no more than 1 ½ hours. Increase climbing time each day, depending on how sore their legs get.
13. Listed below are some of the assignments the candidate should do when not climbing the first week:
 - A. Spend 45 minutes a day tying the following knots: square knot, bowline, clove hitch, half hitch, slip hitch, sheet bend and two pull hitches.
 - B. Dig holes using the following tools: shovel, scoop, spade, 6' and 8' digging bars.
 - C. Make up 3/8", 1/2" and 3/4" lines. Make up 3/8" and 1/2" cum-o-longs. Instruct how to make up and throw hand lines over cross arms and wires.
 - D. Drive 8' digging bar in ground with 12 pound sledgehammer. Tie up pole with 3/4" line using pull hitch.
 - E. Cut and skin wire with hand tools.
14. Instruct on ladder safety.
15. Install 30' ladder on pole or side of building. Instruct on how to install and remove ladders. Each applicant will go through every phase of ladder handling, including climbing to the top and belting in.
16. At the end of the first week hold private interview with each applicant to let them know how they are progressing.

SECOND WEEK

1. Candidates who successfully climb to the 30' level (without fall protection) five times will be issued a body belt and safety strap.
2. Anyone who cannot make 5 climbs to the 30' level by the middle of the week may be disqualified.
3. After all belts are issued, start again at the base of the pole. Instruct how to install and remove safety strap. Walk around pole to the right and then to the left. Practice adjusting the safety strap.
4. After everyone is familiar with the belt they can climb to the 30' mark.
5. Each morning they will go through the following exercise: Climb to the 30' mark and belt in. Walk up and down the pole belted in. Walk all the way around the pole to the left and then to the right. Lean out to the right and take the left gaff out of the pole. Lean out to the left and take the right gaff out of the pole. Adjust safety belt.
6. A 15 minute fun exercise, throwing a 5" ball from one to the other. If a ball is dropped that person has to come down and get the ball.
7. When there is no climbing, start class splicing an eye in a 3/8" line, along with knot tying.
8. Lecture 30 minutes a day on electricity. How do we get electricity to our homes. Primary voltage, secondary voltage and single phase transformers.
9. Near the end of the second week issue each line worker a full set of hand tools.
10. Issue rubber gloves which the class will wear during the rest of the training. Instruct how to test rubber gloves.
11. Bore hole and install a 6 pin cross arm at ground level.
12. Each candidate will bore a hole at 20' and pull up a 6 pin cross arm alone and install on the pole.
- 12A Bore six holes by hand at the 20', 25' and 30' levels.
13. Each candidate will bore a hole at 25' and install an 8 pin cross arm. Not required to pull up alone. A ground worker will assist with the help of a running block and hand line.
14. Introduce class to digger derrick line truck. Instruct how to get in and out of the truck. An overall safety talk.
15. Lash and stub two poles together using #9 lashing wire.

16. Discuss testing and supporting poles before climbing.

THIRD WEEK

1. Continue lashing poles top and bottom.
2. Each candidate will make up and install a street light at 25'.
3. Install a 3 x 1/0 aluminum cable at ground level. Make up services from cable.
4. Make up service at house end.
5. Install double 6 pin cross arms at 10'. Run line wire and dead end using cum-o-longs. Tie and untie using different ties.
6. Install and remove the following types of guy wires; head, anchor and three guy.
7. Lecture on all test equipment.
8. Each candidate shall install and remove a service from a bucket truck.
9. Tour of lobby stock and yard.

FOURTH WEEK

1. Issue Grade "C" job specifications.
2. Safety talks are given throughout the course.
3. Listed below are some of topics given by the Line School Supervisor:
 - A. Issue safety manuals
 - B. Electric shock and burn hazards
 - C. First aid kit and where to find it
 - D. Clothing and how to dress
 - E. Rubber glove rule
 - F. Eye protection rule
 - G. Protective head gear (hard hats)
 - H. Rubber protection rule
 - I. Steel toed shoes (October safety shoe month)
 - J. Ear protection
 - K. Job hazards (spot the hazards)
 - L. Handling chain saws the safe way
 - M. How to lift (back problems)
 - N. Handling poles
 - O. U.R.D. and safety rules
 - P. Faulty tools

- Q. Fire extinguishers
- R. Accident reporting
- S. Hazard communication program (document)

4. Load poles and replace poles that need replacing in the schoolyard. Show warning lights used at night while transporting poles.
5. Practice proper method of sharpening gaffs. Check individuals for technique.
6. Lecture on street lights, bulb sizes, street light heads and brackets.
7. Practice two man pole top rescue.
8. Practice using power saw.

FIFTH WEEK

1. Equipment orientation:

- A. Reclosers
- B. Sectionalizers
- C. Rad/sec switch
- D. Oil switch
- E. Disconnects
- F. Lighting arresters
- G. Regulators
- H. Load break switches
- I. Primary metering
- J. Capacitors

2. Transformer theory:

- A. Installing single phase transformers
- B. Banking single phase transformers
- C. Banking three phase transformers

3. Hands on instruction of test equipment:

- A. Secondary tester (wiggy)
- B. Continuity tester
- C.
- D. Rotation meter
- E. C.I.L.s
- F. Tie tester
- G. Capacitor tester
- H. Clan/tech meter

- I. 4kV phasing meter
 - J. Combination 4kV/15kV phasing meter
 - K. Multi-range voltage detector
 - L. D.C. hi-pot tester
 - M. Hi-line tester
 - N. Capacitor tester
4. Hands on instruction of primary and secondary terminations:
- A. Pre-molded elbows
 - B. Pre-molded terminations
 - C. Pre-molded splices
 - D. Taped terminations
 - E. Heat shrinkable jacketing
 - F. U.R.D. secondary connections
 - G. 600 amp elbows
 - H. U.R.D. equipment and devices (handholes, connections, secondary risers and transformer connections).

SIXTH WEEK

1. Liven up transformer in classroom and show how to test. Each applicant can get the feel of a light secondary load. Use heating coil for load.
2. Garage personnel will instruct class on air brakes and qualify each one to operate bucket truck and corner mount.
3. Park truck on Calvary Street and instruct on proper way to set up a truck with signs, cones and chocks.
4. Show different types of construction on Calvary Street.
5. Lecture on general function of an Overhead Division.
6. Instruct on proper way to talk on the truck radios.
7. Public relations. (Courtesy to the Public).
8. Turn in all tools to Line School.
9. Adjust and fit each applicant with their own tools.
10. Install and remove single and 3 phase services.

Install and remove services:

- a. From a bucket truck

- b. At the pole
- c. At midspan

QUIZ

1. Question and answer period and good luck.

T0042 GRADE B LINEWORKER QUALIFICATION South 8 days- North 7 days
1-1/2 Years Field OJT

Test equipment instruction
Continuity tester
Secondary (wiggy) tester
Statiscopes
Tic tracer
Rotation meter
Clan tech meter
4kV meter
Phasing meter
Capacitor tester
D.C. Hi-pot tester
Fault indicators
Test tapper
Hi-line tester
OP1.1-2A

Apparatus orientation
Reclosers
Sectionalizers
Vacuum switch (rad-sec)
Regulator, reverse flow

Types of transformers
Transformer name plate
1 phase transformer conventional
1 phase transformer CSP
1 phase transformer D/R
Transformer theory and kVA
Connecting 1 phase transformer
Phasing 1 phase transformer
Case grounds
Voltage/load reading

Connecting 3 phase transformer
Transformer connections
Rotation 3 phase service
Locating lost neutrals
Connect/disconnect neutrals

OHMS law
System voltages

Wire and cable identification

Primary feedback

Secondary feedback

4kV oil switch

Install load PU jumper

Inspection of jumpers

Regulators

L.B. switch

Underslung switch

Cutout boxes

Fusing

RDA switch

Step down transformers

G&W oil fused c/o's

Capacitors

Primary metering

Current transformers

Potential transformers

200A load break elbow 1 phase

200A load break elbow 3 phase

200A dead break elbow

Feed-through bushing

Stand-off bushing

Inline splice

Capacitance test points

Capacitance test point fault indicators

600A elbow

600A pad mounted switch

Pad mounted 1 phase transformers

Pad mounted 3 phase transformers

600A S&C PM AB sw.

MOV LA's

Removing grounds

Grade B (2 Days)

North

Review the following procedures:

W5000 – Working on Distribution Circuits

W5001 – Operating and Tagging Switching Devices
W5004 – Safety Procedures for Gloving 15kV and Below
Review use of construction standards.

Outside Work

Install and remove rubber protective equipment.
Install and remove single phase transformer using shotgun and load buster on 7.9kV.

South (1 Day)

All of the above plus – change insulator on single phase construction utilizing hot sticks.
Pull slack on single phase utilizing hot sticks.

0043 GRADE A LINEWORKER QUALIFICATION – 7days
2 years Field OJT

Day 1

- Assessment quiz to determine knowledge of overhead concepts
- Overview of OP 1.1-2A (Accident Prevention Personal Protective Equipment)
- Review climbing training video tape to review proper technique
- Overview use of an issue gaffs and harnesses (including new safety belts)
- Practice climbing to the 15 foot level with feedback, video critique on technique and additional practice

Day 2

- Videotape lesson on ladder safety
- Practice climbing to the 20 foot level with instruction, feedback, video critique on technique and additional practice
- Review of current overhead equipment
- Practice climbing to the 25 foot level with instruction, feedback, video critique and additional practice

Day 3

- Review videotape and lesson on loading and securing poles
- Practice loading and securing poles on trailers
- Practice climbing to the 30 foot level with instruction, feedback, video critique and additional practice
- Review pole setting techniques
- Practice to the 30 foot level without fall protection (if technique indicates they are ready)

Day 4

- Review pole replacement video and lesson on techniques and procedures
- Practice climbing to the 35 foot level with instruction, feedback, video critique and additional practice
- Make 2 satisfactory 35 foot climbs showing acceptable technique without fall protection
- Issue belts and practice moving around the pole with safety belts as well as adjusting safety belts on the pole
- Practice climbing and installing double 8-pin cross arms at the 30 foot level

- Review OP 2.11-1D “Operating and Tagging Switching Devices Connected to DSS Lines and Distribution Circuits”

Day 5

- Review on installing screw anchors and guy wires
- Practice climbing and removing double 8-pin cross arms from 30 foot level
- Installing single-phase transformer with material handling bucket truck (1 man in climbing position)
- Installing a street light using a bucket truck hazardous materials training

Day 6

- Truck training with Mike Lambert from transportation (garage)
- Walk around inspections of overhead line bucket trucks
- Check of CDL licenses
- Updated review of current DOT/Class 2/CDL requirements
- BECo requirements for operation of various types of overhead equipment
- Use and care of test instruments to include live phasing and testing

Day 7 and Beyond

The following topics will be reviewed during the 2nd and 3rd week (if a 3rd week is needed). These topics will be presented with a combination of instructor demonstrations, video tape instruction, hands on practice and practice installation of various types of equipment with climbing as necessary.

- Cut out boxes
- Reclosers
- URD apparatus
- Use of heat shrink torches
- Installation of load break elbows
- Installation of tape terminations
- Installation of pre-molded terminations
- Installation of in-line splices
- Installation of heat shrink splices
- Installation of heat shrink tubing
- Installation of heat shrink end caps
- Installation of 600 amp elbows
- Review of transformer theory
- OHMS Law
- Connect/disconnect neutrals
- Review of transformer types
- Connecting single phase transformers
- Phasing single phase transformers

- Connecting 3 phase transformers
- Phasing 3 phase transformers
- Transformer connections
- Case grounds
- Voltage/load reading
- Sharpening gaffs
- Lobby stock
- Transformer name plate
- Single phase transformer conventional
- Single phase transformer dual ratio
- Single phase transformers CSP (self-contained)
- Various 3 phase transformers
- System voltages
- Primary prints
- Secondary prints
- Wire and cable identification
- Locating lost neutrals
- Meter socket testing
- Primary feed back
- Secondary feed back
- Connect secondary load
- Review of overhead construction
- Housekeeping trucks/equipment
- Red Cross training review
- Install and replace 3 phase services
- Install and replace multiple 3 phase services
- Rotation of 3 phase services
- Hazardous materials communication
- Land ban compliance
- Continuity tester
- Secondary (Wiggy) tester
- Statoscope
- Tic tracer
- Rotation meter
- Clan tech meter
- 4kV meter
- Phasing meter
- C.I.L.s (low tension phasing set)
- Capacitor tester
- D.C. it pot tester
- Fault indications
- Test tapper
- Sectionalizers
- Oil switches

- Regulators
 - Vacuum switches (RAD SEC)
 - Load break switches
- Underslung switches

- Test equipment instruction

Continuity tester

Secondary (wiggy) tester

Statiscope

Tic tracer

Rotation meter

Clan tech meter

4kV meter

Phasing meter

Capacitor tester

D.C. Hi-pot tester

Fault indicators

Test tapper

Hi-line tester

OP1.1-2A

- Apparatus orientation

Reclosers

Sectionalizers

Vacuum switch (rad-sec)

Regulator, reverse flow

- Types of transformers

Transformer name plate

1 phase transformer conventional

1 phase transformer CSP

1 phase transformer D/R

Transformer theory and kVA

Connecting 1 phase transformer

Phasing 1 phase transformer

Case grounds

Voltage/load reading

- Connecting 3 phase transformer

Transformer connections

Rotation 3 phase service

Locating lost neutrals

Connect/disconnect neutrals

OHMS law

System voltages

- Wire and cable identification

Primary feedback

Secondary feedback

4kV oil switch

Install load PU jumper

Inspection of jumpers

Regulators

L.B. switch

Underslung switch

Cutout boxes

Fusing

RDA switch

Step down transformers

G&W oil fused c/o's

Capacitors

Primary metering

Current transformers

Potential transformers

200A load break elbow 1phase

200A load break elbow 3 phase

200A dead break elbow

Feed-through bushing

Stand-off bushing

Inline splice

Capacitance test points

Capacitance test point fault indicators

600A elbow

600A pad mounted switch

Pad mounted 1 phase transformers

Pad mounted 3 phase transformers

600A S&C PM AB sw.

MOV LA's

Removing grounds

Grade A (2 Days)

North

Review the following procedures:

W5000 - Working on Distribution Circuits

W5001 – Operating and Tagging Switching Devices

W5004 – Safety Procedure for Gloving 15kV and Below

Review use of construction standards

Outside Work

Install and remove rubber protective equipment

Install and remove 3 phase transformer on 13.8 using shotgun and load buster

South (1-2 Days)

All of the above plus –

Cross arm change out using hot sticks. Install in-line insulators using hot sticks.

T 0044 OH HOTSTICK QUALIFICATION-2 weeks

SCOPE

1. This is a five day program of instruction for grade "A" lineworkers.
2. Instruction will be given by the line school supervisor.

GENERAL

1. The program will be given to qualified grade "A" lineworkers.
2. Employees shall normally report to the line school by 9:00 AM each day and will be released by 3:30 PM. One half hour will be allowed for lunch.
3. Employees shall report to the line school with their personal tools and equipment.

THE PROGRAM WILL CONSIST OF LECTURES AND DEMONSTRATIONS OF THE FOLLOWING COURSE MODULES:

TC 1.1-2A	Safety
TC 1.2-8C	Leader Lineworkers Policies and Procedures
TC 1.4-6A	Use and Care of Test Instruments
TC 1.4-6B	Miscellaneous Tools and Equipment
TC 1.4-6C	Cable Identification
TC 2.4-1D	Use of Penetrox
TC 2.10-10A	URD Equipment
TC 2.10-10B	URD Apparatus
TC 2.11-1A	Switching Devices
TC 2.11-8A	Automatic Sectionalizing Devices
TC 2.11-9A	Radio Controlled Devices
TC 2.12-1A	Transformation (OH)
TC 2.14-1A	Electrical Devices
TC 4.1-1A	Metering; Primary and Secondary

OVERHEAD TROUBLESHOOTER QUALIFICATION

Test equipment instruction:

- Continuity tester
- Secondary (Wiggy) tester
- Statoscope
- Tic tracer
- Rotation meter
- Clan tech meter
- 4kV meter
- Phasing meter
- C.I.L's (low tension phasing set)
- Capacitor tester
- D.C. hi-pot tester
- Fault indicators
- Hi-line tester
- Load buster
- Current limiting test tapper

OP1.1-2A

OP1.3-1B

OP2.11-1D

OP2.5-1C

T.S. Paper work:

- Types of transformers
- Transformer name plate
- 1 phase transformer CSP
- 1 phase transformer D/R
- Transformer theory and kVA

Case grounds

Voltage/load reading

Connecting 3 phase transformer

Transformer connections

Rotation 3 phase service

Banking 3 phase transformers

Troubleshooting transformers

Communication with DD

Fire extinguishers

General Order 104

Metal enclosed switch

Reclosers

Sectionalizers

Vacuum switch (rad-sec)

Loop schemes

Transfer schemes

3 phase grounds

4kV oil switch

Install load P.U. jumper

Inspection of jumpers

Regulators

L.B. switch

Underslung switch

Cut out boxes

RDA switch

Step down transformers

G&W oil fused C/O's

Capacitors

Primary metering

Current transformers

Potential transformers

URD transformers

4kV regulators

Rev. flow regulators

Explain U.R.D. apparatus

200A load break elbow – 1 phase

200A load break elbow – 3 phase

200A dead break elbow

Feed-through bushing

Stand-off bushing

S&C ATR switch

Capacitance test points

Capacitance test point fault indicators

500 amp elbow (visa-break)

600 amp elbow (T-OP-II)

600A pad mounted switch

Pad mounted 1 phase transformers

Pad mounted 3 phase transformers

Primary metering

Land ban compliance

Hazardous Communications

Thumper truck
SCADA mater switch
Voltage inv. OP1.3-3B
Recloser 4C control
PME 9 switch

OVERHEAD TROUBLESHOOTER FOR YARMOUTH

Introduction:

W5003 “Accident Prevention – Personal Protective Equipment”

Quiz

LV Test Instruments (amp stik)

HV Test Instruments (DC Hi-Pot)

Demonstration:

Wet cap t. prints

Phasing

DC Hi-Pot

URD

W5001 “Operating and Tagging Switching Devices Connected to DSS Lines and Distribution Circuits”

W5000 “Working on Distribution Circuits, Network Feeders and Distribution Supply Lines”

Load Buster

CLTT

Reclosers (WE & USA)

3A, 4C and Forms Controls

Transfer schemes

Sectionalizers

Regulators

Capacitors

600A elbows

Oil switch

PME-9

T1054 UG Lineworker Class 3

Day 1

- Introductions
- Review of course content
- Tour of school
- Review of W5003 "Accident Prevent, Personal Protective Equipment"

Day 2

- Review how to comprise a material stock request
- Review daily work order
- Hands-on: Pre-lim secondary crab with stub-outs; "Spiders" and mains
- Review cable arms, stantions, porcelains and how to insulate a cable arm

Day 3

- Review compliance chapter: OP 1.1-2D "Entering and Working in Underground Locations" and OP1.1-2G "Job Briefing"
- View manhole rescue film
- Review solder and basting oil preparation
- Hands-on: Make solder weights for Dig Safe
- Rasp lead sleeve and beat in

Day 4

- Review compliance chapter: W5003 "Accident Prevention, Personal Protective Equipment"
- Review hydraulic tools
- Review hand tools

Day 5

- DOT review with Mike Lambert (garage)

Day 6

- Compliance Chapter: Hazardous Materials, view asbestos video
- Review basic voltages
- Review test equipment, wiggies, tic tracer, etc.

Day 7

- Compliance chapter: Right to Know, view video
- Review how to prepare a heat shrink kit
- Review bonding
- Review cable connectors

Day 8

- Compliance chapter: Respiratory program
- Review how to set up a tool pan
- Hands-on: How to vee a split copper connector
- Tour location of stock room, tool room, cable and trash bins

Day 9

- Compliance Chapter: Tunnel Training
- Tour a NSTAR tunnel
- Review

Day 10

- CPR/First Aid

T0941 UG LINEWORKER CLASS 2 PART 1

Day 1

- Review Safety Procedures:
 - OP 1.1-2A "Personal Protective Equipment"
 - OP 1.1-2D "Entering and Working in Underground Locations"
 - OP 1.1-2G "Job Briefing"
- Chip lead
- Secondary voltages
- Review banking, picking out neutral, picking out pairs

Day 2

- Test equipment – identification and use
- Transformer theory
- Banking, rotation

Day 3

- Basic Electrical Knowledge Review
- Manhole racking
- Manhole bonding

Day 4

- Review network system
- 7-wire mains – Limiters
- Prelim crabs

Day 5

- Review system voltages
- How to read NSTAR construction standards
 - Hands-on
- 5kV Heat Shrink Live End Cap CS2.1-3.28 (C2011)
- 200 amp elbows: underground – C2015, Padmount – C2012

Day 6

- Hands-on
- Inline Splicing CS 2.1-803

Day 7

- Hands-on
- Sweat Connectors
- 5kv heat shrink straight CS 2.1-3.24

Day 8

Hands-on

- **Proving cable de-energized with the Tag 200 – W6002**
- Prove de-energized and break down 5kV heat shrink (**W1608**)
- Prove de-energized and break down 5kV heat shrink straight
- 5kv heat shrink multiple

Day 9

- Prelim Transformers
- Switching station assembly and installation

Day 10

Final Exam

- **REVIEW OF DAYS 1-9**

UG LINEWORKER CLASS II (PART 1) O.J.T. FIELD EVALUATION

Employee Name _____

Training Program Begins _____

Training Program Ends _____

Training Supervisor(s) _____

Employee Number _____

Field Evaluation Begins _____

Field Evaluation Ends _____

#	<u>TASK</u>	Date Comp.	* <u>Qualified</u> <u>Observers</u> Initials	Trainees Initials	Comments
1	Demonstrates Good Safety Practices				
2	Demonstrates Knowledge of Manhole Entry Procedure				
3	Demonstrates Knowledge of System Voltages				
4	Secondary Cut-over				
5	3 Phase Services				
6	Pre-lim Transformer				
7	Cable racking				
8	Bond frames				
9	Banking 3 Phase				
10	Rotation				
11	Limiters				

12	200 Amp Elbows; padmount & manhole					
13	Inline					
14	5kv Heat Shrink Straight					
15	5kv Live End Cap					

***Qualified: Person who has successfully completed appropriate training and has field experience at the task.**

UG LINEWORKER CLASS II (PART 1) O.J.T. FIELD EVALUATION

Employee Name _____

Training Program Begins _____

Training Program Ends _____

Training Supervisor(s) _____

Employee Number _____

Field Evaluation Begins _____

Field Evaluation Ends _____

#	TASK	Date Comp.	*Qualified Observers Initials	Trainees Initials	Comments
16	Assist in 5kv Phasing				
17	5kv Heat Shrink Multiple				
18					

T0955 UG LINEWORKER CLASS 2 PART 2

Day 1

- Review class outline
- Review safety procedures
- **Review testing equipment**
- Review Ohms Law
- Review construction standard reading
- Review system voltages
- Prepare ends and sweat connector for 5kV heat shrink

Day 2

- Construct 5kV heat shrink with gloves CS 2.1-2.34
- **Proving cable de-energized with the Tag 200 – W6002**
- Prove de-energized and break down 5kV heat shrink (**W1608**)
- Review transformer theory

Day 3

- Secondary connections
- Use of jumpers
- Banking single phase and 3 phase
- C2105 “Construction and Installation of 200 Amp Loadbreak Elbow Terminations in Manholes”
- C2012 “Construction and Installation of 200 Amp Loadbreak Elbow Terminations for 15/25kV Pad Mounted Equipment”

Day 4

- * **Inline splice CS 2.1-8.3**
 - Phone out cables
 - **5kv Heat Shrink Multiple – CS2.1-9.23**

Day 5

- **5kv Live End Cap – C2011**
- **Proving 5kv Live End Cap De-energized WMS 2.9 – 1.11**
- C2000 “Heat Shrink Energized End Cap for 15kV Rated Flat Strap Neutral Cable”

Day 6

- (C2018)
 - CS2.10-10.24 “Installation of 15kV, 600 Amp, T-0P II Deadbreak Elbows for EPR Flat Strap Neutral Cables”

- CS2.10-10.27 “Installing Network Transformers Straight Receptacle Adapters for 15kV Elastimold Disconnectible Splices”

Day 7

- C1737 “Heat Shrink Joint for Flat Strap Neutral Cable, Rated 15kV”
- CS2.7-4.22 “Heat Shrink Termination for 15-25kV Flat Strap Neutral Cable Underground and URD Applications”
-

Day 8

- Prepare ends and sweat connector for 15kV multiple
- 15kV heat shrink multiple

Day 9

- Low tension phasing
Live Phasing of 5kv circuits in a manhole WMS 2.9-1.10
Bonding Underground Cables and equipment CS2.13-2.1

Day 10

Final Exam

- Review days 1 – 9.

UG LINEWORKER CLASS II (PART 2) O.J.T. FIELD EVALUATION

Employee Name _____

Training Program Begins _____

Training Program Ends _____

Training Supervisor(s) _____

Employee Number _____

Field Evaluation Begins _____

Field Evaluation Ends _____

#	<u>TASK</u>	Date Comp.	*Qualified Observers Initials	Trainees Initials	Comments
1	Demonstrate good safety practices				
2	Demonstrate knowledge of system voltages				
3	Single phase services				
4	3-phase services				
5	Secondary cut-over				
6	Transformer connections				
7	7 Wire main connections				
8	Banking single and three phase				
9	200 Amp elbow construction; manhole and padmount applications				
10	5kV heat shrink straight joint				
11	5kV heat shrink multiple joint				

12	Inline						
13	5kV Live end cap						
14	Rack cables						
15	Assist with live phasing						

***Qualified: Person who has successfully completed appropriate training and has field experience at the task.**

UG LINEWORKER CLASS II (PART 2) O.J.T. FIELD EVALUATION

Employee Name	_____	Employee Number	_____
Training Program Begins	_____	Field Evaluation Begins	_____
Training Program Ends	_____	Field Evaluation Ends	_____
Training Supervisor(s)	ANDERSON / O'BRIEN		

#	TASK	Date Comp.	*Qualified Observers Initials	Trainees Initials	Comments
16	Phone out cables				
17	15kV heat shrink straight joint				
18	15kV live end cap				
19	15 kV heat shrink termination				
20	600 amp elbows				
21	15 kv heat shrink multiple				

T1021 UG LINEWORKER CLASS 1

UG LINEWORKER CLASS 1

Day 1

- * Review 4 week classroom work

Review Safety Procedures

Review system voltages

Review Ohms Law

Review transformer theory

Day 2

- * Hands-on review:

- inline splice [CS2.1-8.3 "Installation of 15kV 200 Amp Premolded Joints for #2 AWG XLP or EPR, Concentric Neutral Cable"]
- 200 Amp Elbow Padmount C2012
- 200 Amp Elbow Manhole C2015

Day 3

- * Prove 5kV lead joint de-energized and break down
5kV heat shrink straight [CS2.1-3.24 "5kV Heat Shrink Splice"]

Day 4

- * **Prove 5kV heat shrink joint de-energized W1608**
- * Prove 5kV heat shrink straight de-energized and break down **Hands On**
- * Construct 5kV heat shrink multiple [CS2.1-9.23 "5kV Heat Shrink Joint for Single-Multiple and Double-Multiple Power Cables"]

Day 5

- * Complete 5kV multiple joint
- * Construct 5kV live end cap [C2011]

Day 6

- * Review test instruments
- * Secondary connections: single phase; 3 phase
- * Use of secondary jumpers
- * Banking

Day 7

- * Seven wire mains
- * Limiters
- * Picking out pairs

Day 8

- * Transformer connections
- * Banking transformers

Day 9

- * Live phasing
- * Low tension phasing
- * Phone out cables

Day 10

- * Construct 15kV heat shrink straight [C1737]
- * Manhole bonding - crimp connector, sweat connectors

Day 11

- * **Vee out copper and sweat multiple connector**
- * Construct 15kV heat shrink multiple [C1730]

Day 12

- * Construct 15kV heat shrink termination [CS2.7-4.22]
- * Construct 15kV live end cap [C2000]

Day 13

- * Review test instruments
- Timco Impulse Phaser (T0035)**
Proving Underground Cable De-energized W1605
Break down three conductor lead joint

Day 14

- * **Finish breaking down 3 conductor lead joint**
- * **Boil out cable (test for moisture)**
- * **Construct 15kV single 3 way splice [C1710]**

Day 15

- Finish construction of single three way splice**
- * **Construct 15kV 3 conductor live end cap [C2019] (moved from 14)**

Day 16

- * **Construct 600 amp elbow [C2.10-10.24] (2018)**
- * Tagging lines and circuits (moved from 15)

Day 17

- * SCADA tour
- * Construct network transformer elastimold splice [CS2.10-10.27]

Day 18

- * **Review heat shrink 3 conductor splice construction (C1714)**
- * **Construct 25kv heat shrink straight C1727**

Day 19

- * Review

Day 20

* Test - written; hands-on

TROUBLESHOOTER / INSPECTOR REVIEW

- A. Job Briefing
 - 1. Review OP1.1-2G
 - 2. Discuss requirements for conducting a proper job briefing
- B. Test Instruments
 - Review all test instruments
 - Demo proper use and care of test instruments
- C. Timco Phaser for Cable ID
 - 1. Review and demo use of Timco for cable ID and phase marks on single conductor cable
 - 2. Battery replacement
- D. Use of DC Hi-pot Adapter
 - 1. Demo "Live" DC Hi-pot on cable
 - 2. How to interpret meter
- E. Review 13.8kV Loop Design
 - 1. Show 2 circuit loop scheme
 - 2. Describe U.G. equipment used in loot
 - 3. Show fault isolation
- F. RDA Switch
 - 1. Review operation of switch
 - 2. Review fusing of oil fuse cutouts
- G. SC/MC Switchgear
 - 1. Review operation of switch
 - 2. Review fuse replacement
- H. PME-9 Switch
 - 1. Review operation of switch
 - 2. Review fuse replacement
 - 3. Review 200A and 600A elbows
 - 4. Review Phasing 600A switches
- I. Live Phasing – 5kV and 15kV
 - 1. Live phase 5kV cables (demo)
 - 2. Live phase 5kV 600A switch
- J. Review Auto Source Transfer Switch
 - 1. Operation of switch
 - 2. Fuse replacement

- K. Howard Transformers
 - 1. Review fuse replacement
- L. Switching Stations
 - 1. Switching stations on 13.8kV circuits
 - 2. Single phase and three phase taps to the overhead
- M. Heat Shrink Joints
 - 1. Explain various kit sizes
 - 2. Explain proving H.S. joints
- N. Bolt Connected Joints and Terminations
 - 1. Discuss network transformer terminations
 - 2. Demo bolt connected joint assembly
- O. 200A – 600A Elbows
 - 1. Construction of 200A elbow
 - 2. Operation of 200A elbow
 - 3. Construction of 600A elbow
 - 4. Installation of 600A elbow
- P. Breakers, Relays, Protections
 - 1. 4kV and 13.8kV breaker operation
 - 2. Explain use of relays and protectors
- L. Switching Stations
 - 1. Switching stations on 13.8kV circuits
 - 2. Single phase and three phase taps to the overhead
- M. Heat Shrink Joints
 - 1. Explain various kit sizes
 - 2. Explain proving H.S. joints
- N. Bolt Connected Joints and Terminations
 - 1. Discuss network transformer terminations
 - 2. Demo bolt connected joint assembly
- O. 200A – 600A Elbows
 - 1. Construction of 200A elbow
 - 2. Operation of 200A elbow
 - 3. Construction of 600A elbow
 - 4. Installation of 600A elbow
- P. Breakers, Relays, Protections
 - 1. 4kV and 13.8kV breaker operation
 - 2. Explain use of relays and protectors

Operator Mechanic Apprentice Program

The information below is a draft revision of the existing Operator Mechanic Apprentice Program. The program is being revised to accommodate contractual changes in the 2005 agreement with Local 369 and to enhance the training. Meetings both formal and informal were held with Union and Management personnel in the North & South to obtain input and recommendations. There were many diverse opinions; the plan detailed below is a synthesis of the suggestions and recommendations that made the best business sense which could be implemented.

Level I – Current 12 Weeks

- 4 weeks orientation with On The Job Training (OJT)
- 4 weeks classroom and written exam
- 4 weeks of job assignments in various Divisions/shifts with OJT

Level I – Revised 12 Weeks

1 wk Classroom	3 wks OJT	3 wks Classroom	5 wks OJT
▶Test	▶Test	▶Test	

- 1 week classroom and written exam.
- 3 weeks of job assignments in various Divisions/shifts with OJT
- 3 weeks classroom with an exam at the start and end of the 3 week session.
- 5 weeks of job assignments in various Divisions/shifts with OJT

Comments: 1 week classroom upfront provides the student with more knowledge to understand field operations earlier in the program. At the end of 30 days 2 tests will be administered, this will show the student the level of effort needed to progress through the program and will provide him/her with a sense of whether they have the ability to proceed further.

3 written tests will be administered in Level 1 which should help determine student capability and ability to progress earlier in the program.

Level II – Current 8 Weeks

- 4 weeks classroom and written exam.
- 4 weeks of job assignments in various Divisions/shifts with OJT

Level II – No change to current level.

Level III – Current 12 Weeks

- 4 weeks of classroom instruction and a written examination.

8 weeks of job assignments in various Divisions/shifts with OJT

Level III – Revised 14 Weeks

4 wks Classroom	10 wks OJT
-----------------	------------

►Test

4 weeks classroom and written exam.

10 weeks of job assignments in various Divisions/shifts with OJT

Comments: Existing personnel in the O&M program have expressed a desire for additional time in the field. After Level III classroom is completed it was determined that an additional 2 weeks of field experience would be beneficial.

Level IV – Current 10 weeks

2 weeks classroom and written exam.

8 weeks of job assignments in various Divisions/shifts with OJT and oral operating examination.

Level IV – Revised 12 weeks

2 wks Classroom	8 wks OJT	2 wks Classroom
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►Test

► Oral Exam*

2 weeks classroom and written exam.

8 weeks of job assignments in various Divisions/shifts with OJT and oral operating examination.

2 weeks classroom and oral exam scheduled within 60 days of the completion of Level IV.

Comments: The classroom portion of Level IV was extended and distributed in this manner to provide the student with a review period at the end of the level just prior to the critical oral exam. The logic is to improve the pass rate of the program.

*There were no guidelines in the previous program for a timeframe to take this test after the completion of this level. A 60 day window has been included where the student must make the 1st attempt to take this exam.

Levels I – IV Current – 42 weeks

Levels I – IV Revised – 46 weeks (2wks OJT added/2wks classroom added)

Level V – Current 24 weeks

22 weeks of job assignments in various Divisions/shifts with OJT.
2 weeks classroom and written exam.

Level V – Revised 24 weeks (No change to class/OJT duration – topics added to curriculum)

22 weeks of job assignments in various Divisions/shifts with OJT.
2 weeks classroom and written exam.

Added Topic	North O&M	South O&M
Megger	Lead Role	Lead Role
Micro-Ohm Readings	Lead Role	Lead Role
Routine/Emergency Oil Sampling	Lead Role	Lead Role
Battery NPCC Load Testing	NA	Lead Role

Level VI – Current 24 weeks

22 weeks of job assignments in various Divisions/shifts with OJT.
2 weeks classroom and written exam.

Level VI Revised 24 weeks (No change to class/OJT duration – topics added to curriculum)

22 weeks of job assignments in various Divisions/shifts with OJT.
2 weeks classroom and written exam.

Added Topic	North O&M	South O&M
Hi Pot Testing	Assist	NA
Bucket Truck Hi Pot Testing	NA	Lead Role (NB & PLY Only)
Deep ground rods	NA	Lead Role
Stand up type switchgear (S&C)	NA	Lead Role

Level VII – Current 24 weeks

22 weeks of job assignments in various Divisions/shifts with OJT.
2 weeks classroom and written exam.

Level VII – Revised 25 weeks

22 weeks of job assignments in various Divisions/shifts with OJT.
3 weeks classroom and written exam.

Added Topic	North O&M	South O&M
--------------------	----------------------	----------------------

345kV Air Blast Bkr Timing	Assist	Assist
345kV Non Air Blast Bkr Timing	Assist	Assist
115kV Breaker Timing	Assist	Assist
Power Factor (Bkr)	Assist	Assist
Op Test Recloser Cont	NA	Lead Role
Op Test Cap Control	NA	Lead Role
Op Test Volt Cont	NA	Lead Role
Op Test Motor Operators	NA	Lead Role

Level VIII – Current 24 weeks

22 weeks of job assignments in various Divisions/shifts with OJT.
2 weeks classroom and written exam.

Level VIII – Revised 25 Weeks

22 weeks of job assignments in various Divisions/shifts with OJT.
3 weeks classroom and written exam.

Added Topic	North O&M	South O&M
Power Factor (xfmr)	Assist	Assist
Transf SFRA Test	Assist	NA
Volt Cont Settings (xfmr)	NA	Lead Role
LTC	NA	Lead Role
TTR	Assist	Lead Role
Troubleshoot Sub xfmr	NA	Lead Role (NB Only)
Relay Control Scheme Op Test	NA	Lead Role

The following topics will be covered in OJT for the South:
Shop work.

OCIM Level – To Be Negotiated

1 week classroom and written exam
4 weeks OJT

The OCIM level can be added to existing Level 5 or 6 or added as Level 9 depending upon business need.

Levels I – IV Current – 42 weeks

Levels I – IV Revised – 46 weeks (2wks OJT added/2wks classroom added)

Levels V-VIII Current – 96 weeks

Levels V-VIII Revised – 98 weeks (2wks classroom added).

Total

138 weeks – Current 144 weeks – Revised (149 weeks with OCIM)

Level 1A - Operator

1. Monday

T01001 Overview of O&M Duties

Instructional Plan:

1. Go over the O&M Agreement.
2. Watch schedules
3. O&M duties
4. Cover what is a substation in an electric company.

T0976 Safety Discussion

Instruction Plan

- Invite the safety supervisors to the class.
- "Safety" will cover topics regarding substations.
- "Safety" will lead a questions and answer session.

2. Tuesday

Compliance Training

T0298 1910.269

SG-23 First Aid Kit

SG-29 Hand signals to direct a vehicle

3. Wednesday - Thursday

T1114 Substation Access - Book

- Video/Workbook Safety in Substations & Switchyards
- Video/Workbook Substations & Switchyards
- W1000 Entering Vaults
- Deadly Playground Video
- FR Clothing video – Con Edison
- Manhole Rescue video

SG-14 Work Area

SA1-14 Gasses in substations

T7070 Drum rolling

Level 1 Operators Handbook

4. Friday

T1082

Test Day & give out OJT

3 Weeks OJT

T1082

Test Day & OJT due

SG-1

Introduction to Substations Quiz

Level 1B - Operator

Monday - Thursday

T01003	Principals of Electricity	(AC/DC Book)
T01996	Direct Current	
T01997	Magnetism & Electricity	
T01998	AC Circuits	
T01999	3 Phase Circuits	
	AC Voltage Generation #8001	
SA8-06	Use an Ammeter	
SA3-13	Clamp on ammeter	
SG – 78	3 Quizzes	
SG – 79	Quiz 4 & 5 plus post quiz	

Friday

T0907	Orientation Tour
T1064	Station #106
	Substation picture book
	Procedure Book
SG-46	Insulators

4. Monday - Tuesday

T2120	System Design & Equipment review
	Electrical Distribution System P. 1
	N.E. Power Connection video
	Electronic Dispatch CD
SG- 40	Equipment ID
SG-66	Abbreviations

Wednesday - Thursday

T02160	Isolation Devices	
	Fault Interrupting Devices #8012	
	a. Circuit Breakers,	2160
	b. Knife Blades & Load Breaks	
T12060	Circuit Switchers,	1046
SA6-18	Circuit Switcher	
T12020	Disconnect/Knife blade switches	
SG – 62	ID Disconnects	
	WP 407 Switching transmission disconnects	
	Non-fault interrupting devices #8013	

SA6-12	Transformer & quiz
Friday	
T01006	Prints, Symbols, Numbering GO 103 WS 1.4-1.1 Disconnect numbering Standard 2.13-1.1 numbering system T&D op 1.2-1 numbering for supply lines and circuits
Monday	
T1079	Substation print reading
Tuesday - Wednesday	
T02140	Switching 101 Electrical Distribution System P. 68 Electrical Distribution System P. 109
SA2-15	Gloves
SA3-15	Non-energized work with rubber gloves
SA3-16	Work with rubber gloves
SA4-17	Lights
Thursday	
T1018	Section 9, Tagging
T0963	Tags Section 9A Construction White Tag TIB 460 Tagging & Operating Memoranda WP 461 now in Section 9 Construction Tag Safety Posting Power Point Presentation on Section 9
Friday	
T1069	Friday tour #483 & #43 Electrical Distribution System P. 225 Station Inspection Electrical Distribution System P. 241 Synchronizing
T01004	Safety water gel
Monday	
T01005	Test for Potential Electrical Distribution System P. 68 Go to splicing school and test WP 401 & TIB 401 Detex Safety Posting
SA3-14	Chance tester

SA3-14	AB Chance
T3300	Install & Remove test leads & grounds
Tuesday	
T02130	Phase Identification Electrical Distribution System Pp. 171 & 176
T1009	Test & replace fuses Electrical Distribution System P. 97
Wednesday	
T0965	Substations L&K video 8008
T1045	Grounding in substations
Thursday	
T01008	Inspect and Charge Batteries Battery Shop WP 822A Battery Installation & Replacement Safety Manual 7.13 Batteries
Friday	
T1243	Accidents
T1082	Test Day

**NSTAR / Procedures and Training
Operator Mechanic On-The-Job Training**

Level 1

Trainee's Name _____ Employee #: _____

OJT Dates From: _____ To: _____

<u>SUPERVISOR</u>	<u>TRAINEE</u>	<u>TRIAL DATE(S)</u>
Date Signature	Date Signature	Signature

The Trainee Has Demonstrated An Ability To:

1. Properly put on and remove protective switchgear, including:

☐ switching hood

☐ leggings

☐ coat

☐ gloves
2. Use protective safety equipment, including:

☐ safety glasses

☐ hard hat

☐ steel toe shoes

☐ safety barriers

☐ respirators

☐ self contained breathing apparatus
3. Knows when Fire Retardant clothing is required.
4. ☐ Quickly locate station documents

Comments:

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<p><u>The Trainee Has Demonstrated An Ability To:</u></p> <p>5. Use the following test instruments to test for potential on one or more of listed types of equipment:</p> <p><input type="checkbox"/> Wiggington Voltage Tester (on vault lighting or pump circuit).</p> <p><input type="checkbox"/> Two Pole Detex Phasing Tester (on 4KV bus blades, 13.8KV bus blades, 13.8KV de-energized blades, 13.8KV metal clad switchgear and test device)</p> <p><input type="checkbox"/> Single Pole Detex Phasing Detector (on 4KV bus blades, 13.8KV bus blades, 13.8KV de-energized blades, 13.8KV metal clad switchgear and test device)</p> <p><input type="checkbox"/> Test Lamp (on 220 V or lower voltage circuit)</p> <p>6. <input type="checkbox"/> Read station prints and locate all of the station equipment on the print.</p> <p>7. <input type="checkbox"/> Identify phase markings (on transformers, DSS lines, network feeders, circuits, terminal blades and sectionalizing blades).</p> <p>8. <input type="checkbox"/> Identify equipment using the numbering system (e.g., "a 320-1375H is a 13.8KV DSS line")</p> <p><u>Comments:</u></p>					
50					

	<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
		Date	Signature	Date	Signature	
	<p><u>The Trainee Has Demonstrated An Ability To:</u></p>					
	<p>9. <input type="checkbox"/> Locate and identify equipment in vaults (e.g., vault transformers, elbows or potheads, primary switch, phasing tubes, protector, vault lights, vault pump)</p>					
	<p>10. <input type="checkbox"/> Conduct pressure tests on a network vault transformer and accurately complete counter cards</p>					
	<p>11. Locate, read and record the readings from:</p> <p><input type="checkbox"/> Voltmeters <input type="checkbox"/> Ammeters</p> <p><input type="checkbox"/> KW Meters <input type="checkbox"/> KWH Meters</p> <p><input type="checkbox"/> Transformer Gauges <input type="checkbox"/> Breaker Indicators</p> <p><input type="checkbox"/> Tap Change Indicators <input type="checkbox"/> Pressure Relief Device Indicators</p>					
	<p>12. <input type="checkbox"/> Replace a light switch or receptacle.</p>					
	<p>13. <input type="checkbox"/> Accurately complete an ROI Sheet.</p>					
	<p>14. <input type="checkbox"/> Make accurate, appropriate, and legible entries in a station log book.</p>					
	<p>15. <input type="checkbox"/> Conduct a vehicle inspection and prepare a vehicle inspection report.</p>					
	<p><u>Comments:</u></p>					
	<p>51</p>					

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<p><u>The Trainee Has Demonstrated An Ability To:</u></p> <p>16. <input type="checkbox"/> Locate, test and replace the following types of fuses: primary potential transformer fuses, low voltage and secondary potential transformer fuses, protector fuses, and station service primary and secondary fuses.</p> <p>17. <input type="checkbox"/> Conduct an inspection of a 130V battery, including reading specific gravity and battery meters to check for voltage and grounds, and checking physical condition.</p> <p>18. <input type="checkbox"/> Set up a battery charger and charge station batteries.</p>					
<p><u>Comments:</u></p>					
52					

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<u>The Trainee Has Received Training In and Demonstrated An Ability To:</u>					
1. Locate, test and replace the following types of fuses: <input type="checkbox"/> Amptraps <input type="checkbox"/> Capacitor Bank Fuses					
2. Complete the following minor maintenance tasks: <input type="checkbox"/> Install and remove compressed gas tanks <input type="checkbox"/> Pump water or other fluids from vaults. <input type="checkbox"/> Add liquid/grease to a motor <input type="checkbox"/> Install signs on fences <input type="checkbox"/> Stencil information onto equipment (simulate on cardboard if necessary)					
3. <input type="checkbox"/> Recognize and perform necessary "housekeeping" tasks at stations (e.g., sweeping/mopping decks, cleaning equipment, snow removal/lawn care).					
4. Take and record Load Readings at a: <input type="checkbox"/> Load Center Unit <input type="checkbox"/> Bulk Distribution Station or Network Station <input type="checkbox"/> Transmission Station <input type="checkbox"/> Semi-automatic Indoor Substation					
5. <input type="checkbox"/> Take "End of the Month" readings at various stations.					

DATE(S)	SUPERVISOR		TRAINEE		TRIAL
	Date	Signature	Date	Signature	
<u>In Preparation for the Next Phase of Classroom Training, the Trainee Has:</u>					
1.	Been exposed to each of the following types of facilities and their equipment (through a job assignment or special visit): <input type="checkbox"/> PNU <input type="checkbox"/> Secondary Network Vault <input type="checkbox"/> LCU <input type="checkbox"/> Tertiary Network Vault <input type="checkbox"/> Bulk Distribution Station <input type="checkbox"/> Spot Network Vault <input type="checkbox"/> Semi-automatic Indoor Substation				
2.	<input type="checkbox"/> Observed another operator performing the process of receiving and recording switching orders.				
3.	<input type="checkbox"/> Observed another operator switch, tag, and/or operate the following types of equipment: <input type="checkbox"/> fixed breakers (transmission, 13.8KV and 25KV, 4KV) <input type="checkbox"/> movable breakers <input type="checkbox"/> transformers <input type="checkbox"/> station service				
4.	<input type="checkbox"/> Observed another operator test and install CILs.				
5.	<input type="checkbox"/> Observed the process of low tension phasing.				
6.	<input type="checkbox"/> Observed an operator investigating trouble (e.g., loss of transformer cooling or breaker failing to charge).				
54					

Level 2 - Operator

Week 1

1. Monday – Wednesday

T2170 Switch fixed Circuit breakers
T03320 Switch Transmission Lines
115KV Sta. 447 and #146
SA3-5 Operate a gang switch
SA3-6 Motor Operated Switch
SG 46 Insulators

2. Thursday

T1089 Control Equipment Video

3. Friday

T1088 Draw a substation print
#71 or 514N

Week 2

4. Monday - Wednesday

T03320 Switch Transmission Lines

5. Thursday

T3240 Control Station Activities
T0990 Cambridge

6. Friday

T1088 Draw a Substation Print #106

Week 3

7. Monday - Friday

T2190 Transformers 101 unit #1
T02210 Switch LCU & PNU Transformers
Sta. #483
SA4-06 Station service
SA6-6 Cubicle Gear Switching

Week 4

8. Monday - Tuesday

T3270 Switch LB & PF @ #521
T1254 S&C LB with MS-2 operator
T3310 Switch DSS lines
S&C Switchgear book

9. Wednesday

T03290	Switch Circuits
T3350	Troubleshooting

10. Thursday

T1088	Substation Print Reading #385
-------	-------------------------------

11. Friday

T1004	Safety
T1082	Test Day

**NSTAR / Procedures and Training
Operator Mechanic On-The-Job Training**

Level 2

Trainee's Name _____ Employee #: _____

OJT Dates From: _____ To: _____

DATE(S)

The Trainee Has Demonstrated An Ability To:

1. Test and install CILs on:
☐ a 13.8KV Test Device
☐ Line terminal knife blades
☐ Transformer Phasing Tubes
2. ☐ Test a phasing kit.
3. ☐ Establish a low tension phasing supply at a station when the supply is connected from the battery charger.(Station 329 or Station 2)
4. Receive, record and read back switching orders:
☐ By phone ☐ By radio
5. ☐ Switch and tag a fixed breaker.

Comments:

SUPERVISOR

Date

Signature

TRAINEE

Date

Signature

TRIAL

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<p><u>The Trainee Has Demonstrated An Ability To:</u></p> <p>6. <input type="checkbox"/> Switch and tag a moveable breaker.</p> <p>7. <input type="checkbox"/> Switch and tag an LCU or PNU transformer.</p> <p>8. <input type="checkbox"/> Establish, maintain and tag alternate station service.</p> <p>9. <input type="checkbox"/> Switch and tag auxiliary equipment (e.g., reclosers, fire protection system, transformer cooling system).</p> <p>10. <input type="checkbox"/> Troubleshoot a minor, non-emergency situation (e.g., loss of transformer cooling or breaker failing to charge).</p> <p>11. Install and remove the following types of grounds: <input type="checkbox"/> 115KV or 345KV breaker</p> <p><u>Note:</u> This will require the use of switching hood, coat and gloves, a test for potential, proper orders from the dispatcher.</p> <p><u>Comments:</u></p>					

	<div> <div><u>SUPERVISOR</u></div> <div> <div>TRAIINEE</div> <div>Date Signature</div> </div> </div>	<div> <div>TRIAL DATE(\$)</div> <div>Date Signature</div> </div>	
<div> <div>1. Been exposed to each of the following types of facilities and their equipment (through a job assignment or special visit):</div> <div> <div><input type="checkbox"/> network system</div> <div><input type="checkbox"/> transmission station</div> <div><input type="checkbox"/> GIS Station 514T or 132</div> </div> </div> <div> <div>2. <input type="checkbox"/> Conduct a vault inspection.</div> </div> <div> <div>3. With an another operator switch, tag, and/or operate the following types of equipment:</div> <div> <div><input type="checkbox"/> Circuits</div> <div><input type="checkbox"/> Load breaks and power fuses</div> <div><input type="checkbox"/> Network feeder</div> <div><input type="checkbox"/> Transmission lines</div> <div><input type="checkbox"/> DSS lines</div> <div><input type="checkbox"/> GIS equipment</div> </div> </div> <div> <div>4. <input type="checkbox"/> With an another operator install and remove test leads.</div> </div> <div> <div>5. <input type="checkbox"/> With an another operator apply and remove grounds.</div> </div> <div> <div>6. <input type="checkbox"/> With an operator investigating trouble (e.g., in response to a general station alarm).</div> </div>			
<div> <div>Comments:</div> </div>			

Level 3 - Operator

Week 1

Monday - Friday

T04370 Perform Transfer Bus Switching

Week 2

Monday

T1039 Network Description
Underground Distribution Systems, 8007
Show glow tubes

Tuesday

T1079 Print reading station 53

Wednesday

T0975 Overview #514

Thursday - Friday

T03280 Switch a Network Feeder
71 1N-41 or 12 1N-41
WP 400 Network Feeder
TIP 400 Network Feeder

Week 3

Monday - Thursday

T03280 Switch a Network Feeder
71 1N-41 or 12 1N-41

Friday

T3330 Take/Record Vault load readings
Electrical Distribution System P. 212
T0335 Arc Guard

Week 4

Monday

T4410 Shutdown/Restore a Network Station

Tuesday - Wednesday

T0978 Substation Relays
PT & CT videos 5 Min each
Electrical Distribution System P. 115
Fundamentals of protection #8015
Transmission system protection #7510
SA4-18 Relays

SA6-08	Relay Taps	
SA6-17	Reclosing	
	Video Relays #1 & 2	Need Relays #2 book
	WP 410 #385 stuck breaker	
	TIB 835 Bus Differential	
	WP 432 Pot supply	
	TIB 409 Relay Operation	

Thursday	
T3250	Switch Bulk Power
T1253	Station 385D

Friday	
T1082	Test Day

**NSTAR / Procedures and Training
Operator Mechanic On-The-Job Training**

Level 3

Trainee's Name _____ **Employee #:** _____

OJT Dates From: _____ **To:** _____

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<p><u>The Trainee Has Demonstrated An Ability To:</u></p> <ol style="list-style-type: none"> 1. <input type="checkbox"/> Conduct a formal vault inspection and complete a vault inspection report. 2. Install and remove the following types of leads: <div style="margin-left: 20px;"><input type="checkbox"/> Test Leads <input type="checkbox"/> Grounds</div> 3. <input type="checkbox"/> Switch and tag a 4KV primary network circuit board section. 4. <input type="checkbox"/> Switch and tag a transmission line board section. <p><u>Comments:</u></p>					

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<p><u>The Trainee Has Demonstrated An Ability To:</u></p> <p>6. <input type="checkbox"/> Switch and tag a bulk distribution transformer.</p> <p>7. <input type="checkbox"/> Switch and tag automatic/non-automatic load breaks and power fuses.</p> <p>8. <input type="checkbox"/> Switch and tag an entire network feeder.</p> <p>9. <input type="checkbox"/> Switch and tag a gas insulated substation circuit breaker at Station 514T.</p> <p>10. <input type="checkbox"/> Troubleshoot a station alarm (simulated, if necessary) e.g., "under-voltage or breaker alarm)</p> <p>11. Understands the gas zones on SF6 switchgear e.g. 514T, Putnam bulk.</p> <p><u>Comments:</u></p>					

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<p><u>The Trainee Has Received Training In and Demonstrated an Ability To:</u></p> <ol style="list-style-type: none"> 1. Install and remove the following types of grounds: <ul style="list-style-type: none"> <input type="checkbox"/> 13.8KV line terminal knife blades <input type="checkbox"/> 13.8KV test device (DSS line) <p>Note: This will require the use of switching hood, coat and gloves, a test for potential, proper orders from the dispatcher.</p> 2. <input type="checkbox"/> Respond to an SF6 Level 1-2 gas alarm at Station 514T or 132. If available or simulate an alarm. 3. Conducted a formal station inspection. 4. <input type="checkbox"/> Observed to another operator place new equipment in service (e.g., perform a "pickup" on a network vault transformer if available or simulate) 5. Can perform transfer bus switching. 6. Understands the Station 385D print. 7. Can test for potential for all voltages. 					

Level 4A - Operator

Monday

T1287 New Bedford orientation

Tuesday-Friday

T15000 Switch NB Pine Street

Monday-Wednesday

T15001 Switch NB Industrial

Thursday

T1123 Switch from Prints

Electrical Distribution System P. 149 troubleshooting

Friday

T1082 Test Day

Level 4B - Operator

Monday

T1186 Procedure Review

Tuesday

T02190 Transformers

Video Unit 2

SA2-04 No Load Tap

SA4-15 Transformer fans

SA4-19 Oil systems

SA6-15 LTC Controls

SA6-16 LTC Back up relay

SA6-12 Transformer Alarms

Wednesday

T0964 Capacitors & Reactors
SA4-11 Capacitor
 WP 439A
 WP 439B

Thursday
T3340 Switch SF6 Substation #514 & Putnam, 132

Friday – Thursday
T1123 Switch from Prints
 Seeing the Power of Electricity

Friday
T1082 Test Day

T1031 Qualifying exam to operate substation equipment

**NSTAR Company / Procedures and Training
Operator Mechanic On-The-Job Training**

Level 4

Trainee's Name _____ **Employee #:** _____

OJT Dates From: _____ **To:** _____

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<u>The Trainee Has Demonstrated An Ability To:</u>					
1. <input type="checkbox"/> Conduct a formal station inspection and complete a station inspection report.					
2. <input type="checkbox"/> Place a new equipment in service (e.g., put a new protector, breaker, network transformer, or customer service. If available or simulate).					
3. <input type="checkbox"/> Verify the accuracy of a station print (for a NSTAR station) and report inaccuracies if applicable.					
4. Understands Section 9 of the Safety Manual, Electric Switching and Tagging <ul style="list-style-type: none">• Tagging• Switching Orders					
<u>Comments:</u>					

67

<u>DATE(S)</u>	<u>SUPERVISOR</u>		<u>TRAINEE</u>		<u>TRIAL</u>
	Date	Signature	Date	Signature	
<p><u>The Trainee Has Demonstrated An Ability To:</u></p> <p>5. Perform switching exercises with supervisor: <input type="checkbox"/></p> <p>6. <input type="checkbox"/> "Walk through" the procedure for shutting down and restoring a network station.</p> <p>7. <input type="checkbox"/> Troubleshoot common equipment failures and loading and voltage problems.</p> <p>8. Understands safe working clearances in accordance with the NSTAR Safety Manual section 7.6.</p> <p>9. Properly records and reset substation relay targets.</p> <p>10. Understands the Construction and Local Red Tags.</p> <p><u>Comments:</u></p>					

Level 5 - Hand & Power Tools, Drilling, Batteries, Insulation, Knots, Megger

Monday- ½ Tuesday

T5002 Safety Practices for Mechanic Tasks

T8003 Battery, 1008

Electrical Distribution System P. 191

Substation Batteries video

Substation Battery, Cell and charger replacement video

SA8-11 Battery Capacity Test Set

Safety Manual 7.13

Rubber Glove Policy SP-16

GO 125 Station Batteries

WP 822A Battery Installation & Replacement

SEV-7 Multimeter

½ Tuesday

T7030 Ropes and Rigging

SG-76 Rope

SG-15 Knots

Safety Manual Appendices Number 5

Knot video

Wednesday - Thursday

10003 Insulation Materials

Raychem video

TIB 609 Heat Shrink insulation materials & uses

WP 609A, WP 609B, WP 609C, WP 609D

Friday

T5005 Hand Tools

Safety Manual Section 5 Tools and Equipment & Section 7.9

Threaded fasteners video

Handtool safety in the workplace video

SA1-03 Use of precision tools

SA1-05 Gasket cutter

SA1-10 Wire gauge

SG-05 Hand Tools

SG-09 Construction Tools

SG-44 Bolt cable cutters

T5004 Linear Measurement
SG- 20 Painting
SA1-16 Paint spray gun

T5006 Power Tools/Drill Press Awareness
SG-27 Hoses & Fittings
SG-34 Power Tools
SG-42 Bandsaw
SG-47 Drill press
SG-77 Hydraulic Pipe Bender
Show electric impact gun, grinding wheels, hammer drill

T1501 Shop Safety/Practices, 1080
T5008 Introduction to Shop Work

SG-08 Housekeeping
SG-03 Safe Work Practices Quiz
SG-41 Substation steel, bolts

Monday-Tuesday

T1226 Layout, Drilling and Tapping
T5007 Job layout for metal work
T1502 Copper Bus Work
SA2-2 Construction prints

Wednesday

T9004 Gasket Making
SA1-05 Gasket Cutter
SG-71 Substation materials

Thursday

T15004 Megger, Ducter, Oil Sampling
Megger book
SG-64 Megger
SA3-9 Micro-Ohm Readings
SA3-11 High Resistance Megger
Transformers Module 6, segments 5 & 7, drawing an oil sample
SG-56 Oil test

Friday

T0333 Cad Welding
SG-68 Cadweld
SG-80 Solderless connectors
T1082 Test Day

**NSTAR ELECTRIC GAS / CRAFT & COMPLIANCE
Operator Mechanic On-the-Job Training Program**

Employee Name: _____ **Employee #:** _____ **Supervisor:** _____

Appr. Step/Level: 5 **Subject:** Introduction to Mechanical Work, Batteries

OJT Tasks

1. Layout metal work.
2. Set-up and operate a metal cutting bandsaw.
3. Operate a bench and/or pedestal grinder.
4. Drill metal work using a drill press.
5. Thread holes and shaft using taps and dies.
6. Extract broken studs.
7. Drill metal using a portable electric drill.
8. Tie knots and/or hitches used in rigging assignments.

Apprent. Sign-Off	Date	Supervisor Sign-Off	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

9. Perform a routine battery inspection including the use of Battery Form 3761.

10. Perform a task involving bus or cable insulating (hand or heat shrink).

Comments: _____

Semester Date: From: _____ To: _____ Attended Training School: From: _____ To: _____

**OJT Tasks
(continued)**

Perform a task involving electrical safety.

Perform a task involving grounding.

Perform a task of sweating or tinning copper.

Gasket making.

Install a temporary battery charger

Replace a single battery in a bank of batteries

Perform a task involving using a Megger

Perform a task involving Micro-Ohm testing

Perform oil sampling

Perform battery testing

Comments: _____

Semester Date: From: _____

To: _____

Attended Training School: From: _____

To: _____

Topics Covered In This Step:

1. Operational safety precautions of the drill press, grinder and power saw.
2. Metal work layout.
3. Safety precautions and operation of the electric impact wrench.
4. Bench and/or pedestal grinder set-up and operation.
5. Drill press set-up and operation.
6. Tap and die threading and extraction.
7. Proper use of extractors.
8. Safety precautions and operation of the 1/2" electric drill.

OJT Comments:

Level 6 - Wiring, Rigging, Aerial Lift

Monday

08002	Electrical Wiring
SG-12	ID wire
SG-21	Rolling wire
SG-28	Pull out & Cut wire
SG-49	Measure & Cut wire accurately
SA1-10	Wire Gauge

Tuesday

<u>T8005</u>	<u>Reading Diagrams</u>
	<u>Print Reading Module C book</u>
	<u>Ladder Diagrams video</u>
SA5-02	Diagram Abbreviations
SA5-03	Device functions
SA5-04	Symbols
SA5-06	Pressure Components
SA5-07	Switches Control Circuits
SA5-08	Electrical Devices
SA5-09	Westinghouse control
SA5-11	ID Relay Control Devices
SA5-12	Print Symbols
SA5-14	Manufactures Prints
SA6-13	CB alarms
SG-06	Electrical Instruments
SA2-10	Multimeter
SA8-06	Ammeter

Wednesday

12030	Electric Motors
	AC motor controls video
SA6-10	AC/DC motor
SA4-14	Wire motors
SA4-15	Wire Transformer fans
T8004	Conduit
SG-55	ID conduit
SA1-08	Bend Conduit
SA1-09	Greenlee Pipe bender
SA2-09	Greenlee Hydraulic Pipe bender

Thursday-Monday

T8008 Shop Wiring Project
SG-36 Solder Connections
SA1-06 Greenlee Manual Knockout
SA1-07 Greenlee Hydraulic Knockout

T8006 Troubleshooting Vault Wiring
Digital Multimeter Principles Fluke video
Electrical troubleshooting with a VOM

Tuesday-Wednesday

T7006 Ladders
Ladder Safety video
SG-19 Use of ladders
SA1-4 Extension Ladder
WP 806 Ladders
Safety Manual Section No 5 and Appendices

T7050 Rigging
SG-25 Slings
SG-33 Shackles
SG-32 Lifting Hoist
SG-39 Crane Hand signals
SG-75 Handline
T7060 Rigging @ Station 514T

Thursday

T7079 Aerial Lift Vehicle
Safe operation of elevating work platforms video
SG-37 Bucket truck
SG-45 Bucket rescue
Go to Shaughnessy
Aerial lift video

T0803 Fall Protection
Video high impact fall prevention video
SG-70 Body Belt
SA1-1 Body belt use

Safety Manual Appendices numbers 4, 6, 7, 8, & 9

07070 Drum Rolling & Lifting

Friday

T1082 Test Day

**NSTAR ELECTRIC GAS / CRAFT & COMPLIANCE
Operator Mechanic On-the-Job Training Program**

Employee Name: _____ **Employee #:** _____ **Supervisor:** _____

Appr. Step/Level: 6 **Subject:** Rigging, Wiring, Aerial lift

OJT Tasks

		Apprent. Sign-Off	Date	Supervisor Sign-Off	Date
1.	Perform routine inspection of rigging equipment	_____	_____	_____	_____
2.	Demonstrate the use of hand signals as shown in the Safety Manual appendix number 4.	_____	_____	_____	_____
3.	Tie knots as shown in the Safety Manual appendix number 5.	_____	_____	_____	_____
4.	Estimate the weight and balance of a lift.	_____	_____	_____	_____
5.	Perform a task involving cutting, bending and installing conduit .	_____	_____	_____	_____
6.	Perform a wiring task.	_____	_____	_____	_____
7.	Troubleshoot a wiring problem.	_____	_____	_____	_____
8.	Assist Hi Pot Testing	_____	_____	_____	_____
9.	Bucket Truck Hi Pot testing (NSTAR south only)	_____	_____	_____	_____

10. Deep ground rods (NSTAR south only)

Comments: _____

Level 7 - Circuit Breakers, Protectors, SF6 Gas Cart

½ Monday

T12020	Disconnect/Knife Blades
SA5-23	Disconnect Switch
SA2-06	Adjust Disconnect Switch

½ Monday-Tuesday

SA5-25	Prepare CB New circuit breaker inspections and tests book & video Maintenance of high voltage circuit breakers& switchgear book
T11020	Pressurized systems Review SA5-06 from level 6 Circuit Breaker Unit #2 Video/Workbook Book Maintenance of High Voltage Circuit Breakers - NUS in cabinet

Wednesday-Thursday

T9005	<u>Overhauls on OCB's</u> <u>Circuit Breaker #1 – 1.3.1</u>
T9006	Troubleshooting OCB's
T11030	Accumulator Bag
SA5-17	OCB
SA5-18	OCB mechanism Circuit Breaker #2 – 2.2 & 2.3
SA5-20	115KV OCB WMS 01-01-04 Allis-Chalmers Pneu-draulic operator WMS 01-01-05 Accumulator bag WMS 01-01-03 Allis-Chalmers BZO
SA5-19	Pneumatic Mechanism
SA5-21	Hydraulic Mechanism

Books - McGraw Edison and the Allis Ch Oil Circuit Breaker books in cabinet
Video - Hydraulic Pumps, Pumping Principles & Accumulators - Shows precharging of accumulator

Friday

T12050	Vacuum Circuit Breakers Vacuum Breaker video
SA5-24	Vacuum CB Video and workbook section 1.3.2

Monday

T1415	SF6 Circuit Breaker #1 – 1.4 SF6 Gas Properties & Handling video
SA4-16	Temperature Conversion

SA6-09 SF6 charts
SA6-14 Add SF6
WS 2.3-4.6 514T gas cart
WS 2.3-4.7 Gas Cart
OP 368 Gas Density Relay
WP 827 Handling SF6 gas

Tuesday

T15003 Air Circuit Breakers
Circuit Breaker #1 – 1.2
T9007 Troubleshooting Air Circuit Breakers
WMS 01-01-01 Allis Chalmers 4KV ACB
WMS 01-05-01 GE 13.8 ACB
WMS 01-05-02 GE 4KV AM ACB
WP 600 GE 13.8 Magne Blast
WMS 03-05-01 GE ML-11 Stored Energy
WMS 04-05-01 GE Metal Clad Switch gear

Wednesday

T1416 Maintenance of Protectors
T1417 Troubleshooting Protectors
NSTAR M4001 Network Protectors procedure
W.S. 2.4-2.3 Replacement of Network Transformers & Protectors
W.S. 2.4-3.1 Network Protectors Description
W.S. 2.4-3.2 Network Protector Overhaul – Operating Duties
WP 616 Protector Overhaul GE MG-8 and MG-9
WP 617 Protector Overhaul CM-22
WP 618 Protector Overhaul CMD

Thursday-Monday

T1290 ABB 115 KV SF6 circuit breaker
WP 627
5 minute SF6 video
ABB 115 kv book
T1268 ABB installation

Tuesday

T15005 Circuit Breaker Timing
T0980 Recloser & regulator controls

Wednesday

T0027 Setting regulator controls
T1259 Capacitor controls

Thursday

SA7-03	Set up Doble test set
SA7-04	Doble test procedures
SA7-07	Test a transformer

Friday	
T1082	Test Day

Videos
Contact Resistance Testing
New Circuit Breaker Inspections and Tests

NSTAR ELECTRIC GAS / CRAFT & COMPLIANCE
Operator Mechanic On-the-Job Training Program

Employee Name: _____ **Employee #:** _____ **Supervisor:** _____

Appr. Step/Level: 7 **Subject:** _____

OJT Tasks

	Apprent. Sign-Off	Date	Supervisor Sign-Off	Date
1. Perform routine inspection or maintenance of a OCB	_____	_____	_____	_____
2. Perform routine inspection or maintenance of a Vacuum circuit breaker.	_____	_____	_____	_____
3. Perform routine inspection or maintenance of a SF6 circuit breaker.	_____	_____	_____	_____
4. Perform routine inspection or maintenance of a network protector	_____	_____	_____	_____
5. Perform adding gas to a Station 514 t SF6 breaker .	_____	_____	_____	_____
6. Perform routine inspection or maintenance of a ACB.	_____	_____	_____	_____
7. Assist performing a power factor test	_____	_____	_____	_____

8. Assist in a Circuit Breaker timing test

9. Operate recloser controls (NSTAR south)

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

10. Operate capacitor controls (NSTAR south)

_____	_____	_____
_____	_____	_____

11. Operate regulator controls (NSTAR south)

_____	_____	_____
_____	_____	_____

Comments: _____

—

Level 8 - Transformers, Tap Changers, Air Compressors, Oil Trailer

Monday-Tuesday

- T11040 Air Compressor
 Danger gas under pressure video
- T11060 Ingersol Rand
 WP 615 A 6 month servicing
 WP 615 B one year servicing

Wednesday-Friday

- T12080 Transformers
 Dow corning 561 Silicone liquid video
 Hydran video
- T1128 Tap Changer
 Transformer Inspection & tests
 Transformer Vacuum dry out
 Transformer Vacuum fill
- SG-35 Gas Cylinder
- SA1-11 ID Transformer name plates
- SA1-13 Gas Regulator
- SA1-14 Gas uses
- SA2-04 No-Load Taps
- SA2-14 Trans Nitrogen
- SA4-09 Vacuum Gauge
- SA4-19 Trans Oil systems
- SA5-22 LTC
- SA6-11 Combustible Gas meter
 WP 408 Cooling
 WP 445A & WP 445B No Load Taps
 WP 404 Adding Oil
 WS 2.4-1.6 Three Position Switch
 WS 2.4-1.5 Three Position Overhaul
 Transformers Unit 1 was shown in the Operator class
 Show #514 transformer drawings - in large roll, back room
 Power Point Presentations

Monday-Tuesday

- T9003 Oil Handling
- SG-48 Oil Filter Press

SG-56	Oil Test
SA1-12	Oil tank pump
SA8-12	Oil Filter
SA8-13	Oil Trailer
	TIB 606 Insulating Oil
Wednesday	
T15006	Transformer Turns Ratio Test (TTR)
SA3-10	TTR
Thursday-Thursday	
T1503	Pipe Type Cable
T1504	Pipe Type Cable Heat Exchanger
T1505	Pipe Type Cable Pump House
Friday	
SG-3	Safe work practices quiz
T1082	Test Day

**NSTAR Company / Procedures and Training
Operator Mechanic On-The-Job Training**

Level 8

Trainee's Name _____ **Employee #:** _____

OJT Dates From: _____ **To:** _____

DATE(S)

The Trainee Has Demonstrated An Ability To:

1. Conduct an inspection and maintenance of an air compressor.
2. Conduct an inspection and maintenance of a power transformer.
3. Can change a nitrogen bottle on a transformer
4. Understands safe working practices of oil handling
5. Can operate a pipe type cable heat exchanger
6. Can operate a pipe type cable pump house.
7. Can assist a power factor & SFRA test.
8. Can assist (north) or lead (south) TTR test

SUPERVISOR

Date _____ **Initials** _____

TRAINEE

Date _____ **Initials** _____

TRIAL

9. Can test a LTC (south only)
10. Can test a relay control scheme (south)
11. Can troubleshoot a transformer (NB only)

Comments:

T1090 SYSTEM DISPATCH TRAINING

The System Dispatch Training Course is a 12 week course designed to educate a candidate in the skills needed to become a competent system dispatcher for NSTAR. These duties include maintaining the NSTAR electric system in a safe and economic fashion during routine and abnormal system conditions. The candidate will become well versed in the use of several computer programs including but not limited to Microsoft Windows, M3i, SCADA, Hazeltine, SED and the AVTEC radio/phone system. The course is broken down into the following 19 modules, which include 7 quizzes and 3 tests. There is also OJT incorporated throughout the training program. The class will also take field trips to various stations on the system to observe the equipment being discussed at that time of the training program.

MODULE #	NAME	DAYS
1-T1462	Overview of system design	2
2-T1463	Numbering and phase designation / Quiz #1	2
3-T1464	Principles of switching and tagging / Quiz #2	1
4-T1465	Introduction to board sections	4
5-T1466	Switching board sections / Quiz #3	4
	Review modules 1-5	1
	Test #1 / OJT	1
6-T1467	Introduction to station transformers / OJT	2
	Field trip	1
7-T1468	Switching station transformers / OJT	3
8-T1469	Switching complicated transformers / OJT	3
9-T1470	Test for potential and phasing / Quiz #4	2
10-T1471	Various test equipment / OJT	2
	Field trip	1
11-T1472	Protective relays / OJT / Quiz #5	2
	Review modules 6-11 / OJT	1
	Test #2 / OJT	1
12	SCADA & EMC	4
13-T1473	Switching uncomplicated DSS lines / OJT	4
	Field trip	1
14-T1474	Switching complicated DSS lines / Quiz #6	4
15-T1475	Switching network feeders	4
	Field trip	1
16-T1476	Put network transformer in service / OJT	2
17-T1477	Primary network station / OJT	2
18-T1478	Transfer bus switching / OJT	2
19-T1479	Voltage control / OJT / Quiz #7	2
	Review modules 1-6	1
	Review modules 7-11	1
	Review modules 12-19	1
	Final Test	

	Oral/Written Performance Test	1
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Throughout the entire training program, the following operating procedures, work methods and standards are reviewed:

W5001

2.11-1.1

1.4-1.1

WP401

WP404

WP406

2.7-2.1

2.7-2.2

2.4-3.2

OP317

TI400

TI445 & 445A

TI600

Numbering and phase designation sheet (s/word6.0/whc/proc)

Secondary network plan of restoration

Also, the following tapes are reviewed as well as the accompanying student workbooks:

L&K International Training Series

Distribution System Training

DST-8004	Three Phase Power Systems
DST-8005	System Layout
DST-8007	Underground Distribution Systems
DST-8008	Substations
DST-8010	Substation Transformers
DST-8012	Fault Interrupting Devices
DST-8013	Non-Fault Interrupting Devices
DST-8014	Voltage Control Devices
DST-8015	Relays Electro-Magnetic and Solid State
DST-8017	Differential Relays
DST-8018	Relay Coordination

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 1: TITLE – Intro To system dispatch and Overview of System Design and equipment		Time: 2 days	
Objectives: The trainee will:			
<div>1. Understand the training program goals</div> <div>2. Be familiar with the tasks, responsibilities and demands required of an dispatcher</div> <div>3. Be familiar with the NSTAR organizational chart and how the EMC fits in.</div> <div>4. Be introduced to system design and equipment.</div> <div>5. Be introduced to the energy management system (SCADA).</div>			
INSTRUCTIONAL PLAN		MATERIALS	
Introduction		TAPES	
1. Go over course outline, explaining how the course structure and topics related to dispatch tasks and skill/knowledge requirements. Discuss course goals		8004	
B. Discuss trainees requirements to pass		8005	
2. Discuss the tasks involved in the dispatchers job:		8020	
A. Reading prints and the diagram board.		TOUR OF EMC	
B. Switching and tagging lines, feeders, circuits and Station equipment.		TRANSPARENCIES	
C. Interaction with station operators (giving instructions, Etc.)		STATION PRINTS (4KV, 14KV, 25KV, 115KV & 345KV)	
3. Discuss the attributes (with example) required to become a good dispatcher:		NETWORK	
A. Confidence along with good interpersonal Communication skills.		PNU	
B. Explain that the more we know about station equipment the easier the switching procedures will become.		PRINTS	
Discuss in general the various tagging rules, NSTAR ELECTRIC TAGGING PROCEDURE. Stress that safety Is the most important part of the dispatcher's job.		DSS LINE	
C. Discuss the importance of good work habits.		NETWORK FEEDER	
1. Listening/hearing		TRAINING CLASS ROOM	
2. attention to detail		WORK	
3. note taking/shorthand		PROCEDURES	
4. asking the right questions			

NSTAR Electric & Gas Corp.

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM
Module 2: Numbering and phase designation of Transmission Lines, DSS Lines, Network Feeders and Distribution Circuits		Time: 2 days
<p>Objectives: The trainee will:</p> <ol style="list-style-type: none"> 1. Understand the numbering and phase designation system for 345kV, 230kV and 115kV transmission lines. 2. Understand the numbering and phase designation system for 25kV and 13.8kV distribution system supply lines. 3. Understand the numbering and phase designation system for 13.8kV Network Feeders. 4. Understand the numbering and phase designation system for 4kV and 13.8kV distribution circuits. 5. Understand the numbering and phase designation system for 4kV primary network distribution circuits. 		
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Introduce the numbering and phase designation systems, explaining what they refer to and how they are used. 2. Explain the numbering and phase designation system on 345kV, 230kV and 115kV transmission lines: <ol style="list-style-type: none"> A. Number series: <ul style="list-style-type: none"> _____ 345kV lines have numbers in the 300 series _____ 230kV lines have numbers in the 600 series _____ 115kV lines have numbers in the 500 series B. Associated station numbers: <ul style="list-style-type: none"> _____ 345kV lines have no station number associated _____ 230kV and 115kV lines have a station number included C. Phases: <ul style="list-style-type: none"> _____ 345kV and 230kV lines have phases marked A-B-C _____ 115kV lines have phases marked 1-2-3 3. Explain the numbering and phase designation on 25kV and 13.8kV DSS lines: <ol style="list-style-type: none"> A. All have a station number included B. Line numbers the same at all stations connected C. Conductors jointed together in parallel designated X+Y or X+Y+Z D. 25kV DSS lines numbered in the 2000 series; 13.8kV DSS lines number in the 51 to 299 or 1000 series E. 25kV DSS lines have phases marked numerically; phase 1 not always in the middle of transformer primary switches F. 13.8kV DSS lines have phases marked 1-2-3 		MATERIALS <p>Transmission & system Line prints (389 Line, 329-510, 282-602) Station Diagrams</p> <p>NUMBER AND PHASE DESIGNATION HANDOUT</p> <p>QUIZ #1</p>

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 3: TITLE - Principles of Switching, Isolating and Tagging		Time: 1 day	
Objectives: The trainee will: 1. Be introduced to procedure documents 2. Understand the definition of switching 3. Understand the importance of protective tags 4. Be familiar with the rules of switching and tagging 5. Know the purpose and meaning of each type of tag			
INSTRUCTIONAL PLAN		MATERIALS	
1. Introduce the various procedural documents, explaining in general the purpose of each type and the differences between them. 2. Define A. Switching B. Operating (opening or closing breakers; setting control switches) C. Isolating (racking breakers; opening disconnects, load breaks or primary switches; opening or removing fuses) 3. Explain why switching is done (e.g., line faults) and discuss types of switching activities. Explain the basic sequence of switching: A. Emphasize that the sequence is followed in all switching tasks (only the particular procedures within each step differ). B. Describe the purpose of each step 4. Introduce and discuss tagging (e.g., checking devices open or removed, physically installing applicable tags) 5. Discuss safety considerations: A. Proper sequence of switching B. Switching equipment de-energized when possible C. Make sure workers are clear before energizing equipment		TAPES 8006 8008 WHAT HAPPENED TO CHARLIE VIDEO STATION PRINTS Switching sheets MWT CARDS SCADA SIMULATOR NSTAR TAGGING PROCEDURE	

NSTAR ELECTRIC TECHNICAL TRAINING	SYSTEM DISPATCH TRAINING PROGRAM
Module 4: Introduction to Board Sections	Time: 1 Day
<p>Objectives: The Trainee will:</p> <ol style="list-style-type: none"> 1. Understand the purpose, function and limitations of knife blades/disconnects. 2. Understand the purpose, function and limitations of load break switches and power fuses. 3. Understand the purpose, function and limitations of different types of primary switches. 4. Know the symbols for knife blades, load breaks and power fuses. 5. Understand the purpose and function of various types of circuit breakers and switchers. 6. Understand how circuit breakers and switchers are operated. 7. Know the symbols for the various circuit breakers and switchers. 	
<p>INSTRUCTIONAL PLAN</p> <ol style="list-style-type: none"> 1. Review (from Module 3) the definition and purpose of isolating devices (ask trainees for definitions and examples). 2. Discuss knife blades/disconnects: <ol style="list-style-type: none"> A. Explain their purpose and where they are used (e.g. simple single blade, single blade double throw, double blade double throw). B. Describe the function of different types of disconnects (e.g. switch stick operated, gang hand and gang motor operated). C. Explain/describe respective symbols. D. Explain safety precautions related to the operation of knife blades/disconnects (e.g., circuit breaker must be checked open; knife blades may be operated while energized; never used to make or break load). E. Demonstrate in training shop how knife blades/disconnects are operated 3. Discuss load breaks and power fuses: <ol style="list-style-type: none"> A. Explain their purpose and where they are used. A. Describe different types of load break/power fuse installations (e.g. normal: double set of power fuses, single set of power fuses; auto: follow-up installations). B. Explain "kirk" key interlock systems at various LB/PF. Installations. D. Explain/describe respective symbols. E. Demonstrate operation of load breaks/power fuses. 	<p>MATERIALS</p> <p>TAPES 8012 8013 Station prints: (4)(43)(139)(250)</p> <p>WORK STANDARD W5001</p> <p>OP SCHOOL KB DISC.</p> <p>Station prints (SC-4</p> <p>Transparencies, handouts</p>

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM
Module 5:	SWITCHING ON 4KV, 14KV AND 25KV BOARD SECTIONS	Time: 2 days
Objectives: The trainee will: <ol style="list-style-type: none"> 1. Be able to issue orders to switch, isolate and tap 4kV, 13.8kV and 25kV station board sections (e.g., circuit, bus tie, transformer) 2. Be able to identify 4kV, 14kV and 25kV board sections 3. Input data into SED. 		
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Present sample station diagrams and review what "board sections" are, having trainees identify and define them on the prints. 2. For each of the 3 types of board sections, using relevant jobs taken from recent daily reports: <ol style="list-style-type: none"> A. Explain loading limitation to be aware of before any switching begins. B. Explain the necessary isolation. C. Explain the required tagging. D. Role-play issuing the switching orders as dispatcher to operator (trainee to instructor) E. Input data in SED event. 3. Preview 14kV board sections, explaining how they differ from the 4kV sections 4. For each of the 3 types of board sections; using relevant jobs taken from: <ol style="list-style-type: none"> A. Explain loading limitations to be aware of before any switching begins. B. Explain the necessary isolation. C. Explain the required tagging. D. Role-play issuing the switching orders as dispatcher to operator (trainee to instructor) E. Input data into SED 5. Preview 25kV board sections 		MATERIALS <p>Transparencies of station Diagrams (PNU-17) (110) (139)</p> <p>Transparencies of station Diagrams DSS line and network feeder Prints 376-90, 71-1N12 59-1393H</p> <p>Transparencies of station Diagrams: 329, 250, 110 DSS line prints 17-2211, 445-2136, 468-2412</p>

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 6: INTRODUCTION TO STATION TRANSFORMERS		Time: 2 days	
Objectives: The trainee will:			
<div><div><div>1. Understand the theory of operation of single-phase and three phase transformers.</div><div>2. Understand the function and purpose of transformer support system (e.g. insulation, Cooling, nitrogen systems, lightning protection, gauges, alarms.)</div><div>3. Be familiar with transformer load ratings.</div><div>4. Understand the purpose and function of tap changers.</div><div>5. Understand the function of instrument transformers.</div><div>6. Understand the function of station service transformers.</div><div>7. Know the symbols for the various types of transformers.</div><div>8. Be familiar with BUS TIES and how they associate with transformer.</div></div></div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div><div><div>1. Define transformers explaining:<div><div>A. how they are used to transfer power from one area to another, magnetically, at different voltages</div><div>B. the difference between single-and three phase transformers</div></div></div></div><div><div>2. Describe the purpose, function and symbols of the following transformer support systems:<div><div>A. cooling systems (e.g., insulation medium, fans, pumps)</div><div>B. nitrogen (gas seal) system</div><div>C. lightning protection (Las)</div><div>D. pressure relief devices</div><div>E. alarms and gauges</div></div></div></div><div><div>3. Explain transformer load ratings and the impact of cooling system on these ratings.</div></div><div><div>4. Discuss ratio adjuster, no load tap changers and tap changers under load, including:<div><div>A. how they are operated</div><div>B. how they affect voltage and current</div></div></div></div><div><div>5. Discuss the purpose and function of instrument transformers:<div><div>A. potential transformers (primary and secondary fuses, resistors)</div><div>B. potential devices</div><div>C. current transformers</div><div>D. wave traps</div></div></div></div></div>		<div><div>TAPES</div><div>8010</div><div>8011</div></div> <div><div>STATION PRINTS</div><div>SNV PRINTS</div></div>	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 7: SWITCHING ON STATION TRANSFORMERS		Time: Day	
Objectives: The trainee will:			
<div><div>1. Be able to issue orders to switch, isolate and tag station transformers: 4kV, 13.8kV, 25kV and 115kV.</div><div>2. Recognize loading limitations of transformers.</div><div>3. Be able to identify transformer board sections.</div><div>4. Input SED event.</div></div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div><div>1. Review the purpose and function of station transformers, discussing, in general, their similarities and differences with respect to switching tasks ("C" transformer at Station 13; 110A at 65; 110C at 250; 110B at 483).</div><div>2. For each type of station transformer, using relevant jobs taken from recent daily reports:<div><div>A. Explain transformer loading limitations to be aware of before any switching begins.</div><div>B. Explain the necessary isolation.</div><div>C. Explain the required tagging.</div><div>D. Role-play issuing the switching orders as dispatcher to operator (trainee to instructor).</div><div>E. Input SED event.</div></div></div><div>3. Conduct class quizzes.</div></div>		Transparencies of station diagrams: 13, 65, 250, 483	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 8: COMPLICATED STATION TRANSFORMER SWITCHING		Time:	
Objectives: The trainee will:			
<div>1. Understand the 13.8kV neutral configuration at station.</div> <div>2. Understand the tie-bus scheme.</div> <div>3. Be able to issue switching orders to isolate and tag 110 transformers.</div> <div>4. Be able to issue switching orders to return 110A and 110B transformers to service.</div> <div>5. Understand the disconnect numbering system for 345kV, 230kV and 115kV transmission lines and transformers.</div> <div>6. Be able to identify the numbering classification used on various devices.</div> <div>7. Be able to issue switching orders using the disconnect numbering system.</div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div>1. Introduce this module by reviewing station transformers and previewing key characteristics associated with switching at station (483):<div>A. 13.8kV neutral configuration</div><div>B. tie-bus scheme</div><div>C. disconnect numbering system</div></div> <div>2. Explain the 13.8kV transformer neutrals at (483):<div>A. minimum of two 13.8kV neutrals closed at all times</div><div>B. always open associated 13.8kV breaker before opening or closing neutral disconnect.</div></div> <div>3. Explain the switching sequence to open or close the 1-2 to 3-4 tie bus breaker.</div> <div>4. Have trainees write the switching to switch, isolate and tag 110A or 110B transformer.</div> <div>5. Role-play having trainees give switching orders to operators for above.</div> <div>6. Tag screen at EMC.</div> <div>7. Have trainees write switching to return 110A or 110B to service.</div> <div>8. Role-play having trainees give switching orders to operators for above. (Emphasize importance of taking load readings and checking status of entire station via SCADA* before beginning and after completion.)</div> <div>9. Practice filing out system dispatch MWT control sheet.</div>		<div>STATION PRINTS</div> <div>250</div> <div>4</div> <div>385D</div> <div>385T</div> <div>ONE LINE DIAGRAMS</div> <div>385D</div> <div>250</div> <div>4</div> <div>Work standard 1.4-1.1</div>	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 9: TEST FOR POTENTIAL AND PHASE IDENTIFICATION		Time: 2 Days	
Objectives: The trainee will:			
<div>1. Know what circumstances require a test for potential.</div> <div>2. Know which test for potential is appropriate under given circumstances.</div> <div>3. Understand how tests for potential are conducted at various locations.</div> <div>4. Be able to issue correct switching orders to safely perform potential tests.</div> <div>5. Understand the theory and proper procedures for installing CIL's and applying LT. phasing current.</div> <div>6. Be able to issue orders to install CIL's or perform LT phasing at various installations (i.e., SNV's/TNV's, PNU's/LCU's, SC's/MC's, stations).</div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div>1. Define testing for potential, explaining when tests for potential are required.</div> <div>2. Explain the purpose and function of test equipment used to test for potential.</div> <div>3. Explain the purpose and function of the 4kV and 13.8kV test devices.</div> <div>4. Explain the information necessary to be included in potential testing switching orders at the following:<div>A. SNV's/TNV's</div><div>B. PNU's/LCU's</div><div>C. transformers</div><div>D. buses</div></div> <div>5. Have trainees write and issue test-for-potential orders.</div> <div>6. Define "phasing identification", explaining the purpose and theory of CIL's and LT phasing.</div> <div>7. Demonstrate testing and application of CIL's.</div> <div>8. Demonstrate splicers taking phasing from manhole to CIL's at station.</div> <div>9. Demonstrate and have trainees perform LT phasing.</div> <div>10. Role-play issuing LT phasing orders (trainee to instructor).</div> <div>11. Role-play receiving application of CIL's back report.</div>		<div>OP #343</div> <div>Detex testers</div> <div>Mineralac tester</div> <div>Station prints</div> <div>SNV/TNV prints</div> <div>PNU prints</div> <div>LCU prints</div> <div>WP #406</div> <div>Op school</div> <div>LT phasing simulator and set of CIL's</div> <div>LT phasing simulator</div>	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 10: LOW AND HIGH VOLTAGE TEST EQUIPMENT (TIMCO SET, THUMPER, KENETRON TESTING AND POWER FACTOR TESTING)		Time: Day	
Objectives: The trainee will:			
<div><div>1. Understand the theory and proper procedures to apply the TIMCO or thumper.</div><div>2. Be able to issue orders to apply the TIMCO to lines, feeder and circuits.</div><div>3. Understand the purpose of Kenetron and power factor testing.</div><div>4. Know the required procedures for isolating and tagging equipent for Kenetron and power factor testing.</div></div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div><div>1. Introduce and define high and low voltage testing, Explaining in general, the difference between the two and the ADSD's role with respect to the various types of tests.</div><div>2. Explain the theory and application of the thumper:<div>A. chasing faults</div><div>B. testing cables</div></div><div>3. Explain the theory and application of the vahey test set:<div>A. chasing faults when thumper not available</div><div>B. identify cables during permit work.</div></div><div>4. Have TIMCO and thumper demonstrated at splicing school.</div><div>5. Explain where application of vahey test current is recorded on Master Work tag control sheet</div><div>6. Explain kenetron testing:<div>A. when/why it is conducted</div><div>B. voltage levels: 42.5kV DC on 13.8kV cables; 65kV DC on 25kV cables</div><div>C. duration of test</div><div>D. tagging requirements</div></div></div>		<div>TIMCO, thumper</div> <div>Master work tag control Sheet</div> <div>Visit site where kenetron Testing is being performed</div>	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 11: BASIC PROTECTIVE RELAYS		Time:	
Objectives: The trainee will:			
<div><div><div>1.</div><div>Understand the function of protective relays.</div></div><div><div>2.</div><div>Understand the function of different types of relays.</div></div><div><div>3.</div><div>Be able to analyze and use basic relay information in troubleshooter on lines and Circuits.</div></div><div><div>4.</div><div>Be able to analyze and use basic relay information in dealing with faults on station Transformers or buses.</div></div><div><div>5.</div><div>Understand the function of instrument transformers in basic protective relay schemes.</div></div></div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div><div><div>1.</div><div>Define the purpose and function of protective relays (e.g., to remove faulted equipment from the system promptly; minimize damage to elements of the systems; should only isolate the defective parts, etc.)</div></div><div><div>2.</div><div>List and introduce the 6 different types of relays and Their respective symbols.</div></div><div><div>3.</div><div><div>Explain the fundamentals and operating principles of <u>Overcurrent relays</u>:</div><div><div>A.</div><div>Explain the difference between time and Instantaneous elements.</div></div><div><div>B.</div><div>Demonstrate how typical overcurrent relays operate.</div></div><div><div>C.</div><div>Explain how to interpret and use relay information While switching.</div></div></div></div><div><div><div>4.</div><div>Explain the fundamentals and operating principles of Directional overcurrent relays:</div><div><div>A.</div><div>Emphasize how directional overcurrent relays are selective to the direction of fault current.</div></div><div><div>B.</div><div>Demonstrate how directional relays operate.</div></div><div><div>C.</div><div>Explain how to interpret and use relay information while switching.</div></div></div></div></div>		<div><div>TAPES</div><div>8015</div><div>8016</div><div>8017</div><div>8018</div><div>8019</div><div>RELAY SCHEMATIC HANDOUT</div></div>	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 12: STATION DIAGRAMS AND LINE/NETWORK FEEDER PRINTS AND EMC BOARD & OFFICE AUTOMATION		Time:	
Objectives: The trainee will:			
<div><div><div>1. Recognize the symbols representing station equipment and devices necessary for Switching and tagging operations.</div><div>2. Be able to interpret the symbols on a station diagram, identifying the equipment and Devices and describing their functions and limitations.</div><div>3. Be able to identify other station equipment and devices likely to be encountered on Station diagram (e.g. stress cones).</div><div>4. Be able to use follow sheets in conjunction with line or feeder prints.</div><div>5. Understand the function of the system diagram board.</div><div>6. Understand the layout of the system diagram board.</div><div>7. Be able to identify color codes and symbols used on the system diagram board.</div><div>8. Understand how the board relates to station prints.</div><div>9. Be able to navigate in SCADA and perform basic operations</div><div>10. Be able to use the avtec system as both a phone and radio</div></div></div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div><div><div>1. Present a sample station diagram and describe its Purpose and characteristics.</div><div><div>A. Explain the objectives of the unit as they relate to station diagrams.</div><div>B. Explain why dispatchers must read station diagrams to Perform their duties.</div><div>C. Introduce the various types of prints used in system Dispatching (station prints, line prints, network feeder prints, follow sheets).</div></div></div><div>2. Review symbols for station equipment and devices Covered in Unit II modules.</div><div>3. Explain the types and functions of various miscellaneous apparatus represented on station diagrams.</div><div>4. Ask trainees to name the equipment and devices shown on a given station diagram and describe their functions and operating limits</div><div>5. Review SCADA manual and basic operator actions</div><div>6. Review AVTEC phone/radio system</div></div>		<div>TAPES</div> <div>8021</div> <div>8022</div> <div>8023</div> <div>SCADA MANUAL</div> <div>AVTEC MANUAL</div>	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 13: SWITCHING UNCOMPLICATED DSS LINES WITH UP TO THREE STATIONS CONNECTED		Time: Day	
Objectives: The trainee will:			
<div><div><div>1.</div><div>Be able to write the switching to isolate and tag an uncomplicated* DSS line.</div></div><div><div>2.</div><div>Be able to issue switching orders, in the proper sequence, to isolate and tag an Uncomplicated DSS line.</div></div><div><div>3.</div><div>Be able to fill out a master work tag control sheet while performing DSS line switching.</div></div><div><div>4.</div><div>Be able to issue proper clearances to field personnel.</div></div><div><div>5.</div><div>Be able to write the switching to return an uncomplicated DSS line to service.</div></div></div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div><div><div>1.</div><div>Review DSS lines and discuss, in general, the key Issues around switching on DSS lines.</div></div><div><div>2.</div><div><div>For each of the 3 representatives DSS lines:</div><div><div>A.</div><div>Explain the switching to isolate and tag the line.</div></div><div><div>B.</div><div>Role-play issuing switching orders</div></div><div><div>C.</div><div>Practice filling out M.W.T. control sheet.</div></div><div><div>D.</div><div>Explain procedure for giving out clearances.</div></div><div><div>E.</div><div>Explain how to phase check line before return switching.</div></div><div><div>F.</div><div>Explain the switching to return line to service in The proper sequence.</div></div><div><div>G.</div><div>Role-play issuing return switching.</div></div><div><div>H.</div><div>Tag SCADA devices</div></div></div></div></div> <div><div>3.</div><div>Conduct class quizzes</div></div> <div><div>4.</div><div><div>Conduct field trip to (483) to demonstrate isolation of Various type of equipment:</div><div><div>A.</div><div>draw out breaker</div></div><div><div>B.</div><div>primary switch</div></div><div><div>C.</div><div>potential transformer issues</div></div><div><div>D.</div><div>station service transformer fuses</div></div></div></div>		<div>DSS line print</div> <div>Station prints</div> <div>483-1492 line print</div> <div>Sta. (483) station print</div> <div>LCU (483) station print</div> <div>M.W.T. control sheet</div> <div>SCADA Tagging</div> <div> </div> <div>Written and oral switching orders</div> <div> </div> <div>Line prints:</div> <div>(483-1492)</div> <div>(329-2211)</div>	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 15: LOW VOLTAGE A.C. NETWORKS AND SWITCHING NETWORK FEEDERS		Time:	
Objectives: The trainee will:			
<div><div>1. Understand the philosophy of the six low voltage A.C. networks.</div><div>2. Be aware of the economic and reliability advantages of low voltage A.C. networks.</div><div>3. Understand the network monitoring system.</div><div>4. Understand the island concept of the low voltage networks.</div><div>5. Know the difference between secondary grid networks and secondary spot networks.</div><div>6. Understand the procedure to shut down an entire low voltage A.C. network.</div><div>7. Understand the procedure to restore part of or an entire low voltage A.C. network.</div><div>8. Know the symbols for low voltage A.C. network equipment.</div><div>9. Be able to write the switching to isolate and tag a network feeder.</div><div>10. Be able to issue switching orders to isolate and tag a network feeder.</div><div>11. Be able to fill out master work tag control sheet while performing above.</div></div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div><div>1. Introduce low voltage A.C. networks, describing in General their purpose and the philosophy behind them. Review (and/or define) key related terms (e.g., low voltage, network secondary).</div><div>2. Explain (compare and contrast) the two basic types of Networks: grid and spot.</div><div>3. Identify and describe the 6 low voltage networks in the NSTAR system.</div><div>4. Introduce and describe equipment symbols associated With low voltage A.C. networks (i.e. symbols not Covered in previous modules).</div><div>5. Explain the network monitoring system including the Hazeltine equipment.</div><div>6. Explain the procedure to shut down any of the six network stations.</div><div>7. Explain the procedure to restore part of or an entire low Voltage A.C. network</div><div>8. Review/quiz on network equipment symbols.</div></div>		<div><div>Tape 8007</div><div>Station prints: (2)(12)(53)(71)(492)(514)</div><div>General Electric: "Electric Utility System and Practice: book</div><div>Major secondary network disturbance plan of restoration</div><div>Major secondary network disturbance plan of restoration</div></div>	

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM
Module 16: Test/Place New Network Transformers in Service		Time: 1.5 Days
<p>Objectives: The Trainee will:</p> <ol style="list-style-type: none"> 1. Know the procedures to test and place new equipment in service. 2. Be able to issue switching orders to test and place new network transformers and associated protector in service. 3. Be able to fill out master work tag control sheet for testing and placing new equipment in service. 4. Understanding use of red code locks. 		
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Introduce the module by explaining, in general, the circumstances under which equipment is tested and/or placed in service and the dispatchers role in the process. 2. Explain the procedures followed to test and place new equipment in service 3. Explain the switching orders necessary to test and place in service a new network transformer: <ol style="list-style-type: none"> A. Close primary switch. B. Close protector. C. Remove protector fuses. D. Rack and close station breaker to energize feeder 4. Practice filling out master work tag control sheet during pick-up. 5. Describe red code lock procedure: <ol style="list-style-type: none"> A. Only used on individual transformers or protectors. B. Only dispatchers have code numbers. 		MATERIALS Operating Procedure #310

NSTAR ELECTRIC TECHNICAL TRAINING	SYSTEM DISPATCH TRAINING PROGRAM	
Module 17: 4kV Primary Network Feeders	Time: Day	
<p>Objectives: The Trainee will:</p> <ol style="list-style-type: none"> 1. Understand the philosophy of the three 4kV primary networks (Roxbury, Brookline, Somerville). 2. Know the symbols associated with 4kV network equipment 		
<p>Introduce 4kV primary networks in general and compare/contrast them with low voltage A.C. networks.</p> <p>Explain how 4kV primary networks function:</p> <ol style="list-style-type: none"> A. Circuits run from one PNU to another PNU. B. Sometimes more than one circuit running between the same two PNU's. <p>A few radial circuits run out of PNUs.</p> <p>Discuss tying primary network circuits together with radial circuits</p> <p>Discuss the advantages of primary networks:</p> <ol style="list-style-type: none"> A. Do breaker overhauls without outside switching. B. Supply heavy load with fewer transformers. C. Less outage on short circuits. <p>Simulate job to take breaker out at one end of a primary network circuit.</p>	MATERIALS	

NSTAR ELECTRIC TECHNICAL TRAINING	SYSTEM DISPATCH TRAINING PROGRAM
Module 18: Transfer Bus Switching	Time: Day
<p>Objectives: The Trainee will:</p> <ol style="list-style-type: none"> 1. Understand the purpose and function of a transfer bus. 2. Understand the principles of transfer bus switching. 3. Be able to issue orders to switch and tag: <ol style="list-style-type: none"> A. A circuit board section onto another circuit via the transfer bus. B. A circuit carrying station service onto another circuit or transformer via the transfer bus. 4. Understand how to isolate board sections or equipment by transfer bus switching. 5. Be able to input SED events. 	
<p>INSTRUCTIONAL PLAN</p> <p>Review the function of a transfer bus and explain why transfer bus switching is performed.</p> <p>Use station prints to demonstrate and explain the procedure to:</p> <ol style="list-style-type: none"> A. Transfer the load of a circuit via the transfer bus to another circuit. B. Transfer the load of a circuit carrying station service onto another circuit or transformer via the transformer. C. Transfer the load of a circuit to a transformer via the transfer bus. <p>Use the simulator board and station prints to practice transferring:</p> <ol style="list-style-type: none"> A. A circuit via a circuit. B. A circuit with station service. C. A circuit via a transformer. <p>Have trainees practice issuing orders for transfer bus switching.</p> <p>Conduct class quizzes.</p>	<p>MATERIALS</p> <p>Station Prints WP 458</p>

NSTAR ELECTRIC TECHNICAL TRAINING		SYSTEM DISPATCH TRAINING PROGRAM	
Module 19: CAPACITORS, REACTORS, 115 & 345KV RINGS		Time: 1 Day	
Objectives: The trainee will:			
<div>1. Understand the duties involved in maintaining the transmission system under the directions of the BPSCC.</div> <div>2. Understand the purpose and function of the capacitors and reactors.</div> <div>3. Know how to perform the weekly relay testing program.</div>			
INSTRUCTIONAL PLAN		MATERIALS	
<div>1. Review the design of 115 and 345kV rings, transformers, capacitors and reactors.</div> <div>2. Discuss the operation of capacitors and reactors and the Effect they have on system voltage and reactive load.</div> <div>3. Review the weekly channel relay testing form and how To perform the testing via SCADA.</div> <div>4. Explain the working relationship between the ADSD and the BPSCC.</div>		<div>Tape 8014</div> <div>Capacitor/Reactor work book</div> <div>Voltage control pages on SCADA</div>	

T1091 DISTRIBUTION DISPATCH TRAINING

The Distribution Dispatch Training Course is a 12 week course designed to educate a candidate in the skills needed to become a competent distribution dispatcher for NSTAR. These duties include maintaining the NSTAR electric system in a safe and economic fashion during routine and abnormal system conditions. The candidate will become well versed in the use of several compute programs including but not limited to Microsoft Windows, M3i, SCADA, Hazeltine, SED and the AVTEC radio/phone system. The course is broken down into the following 15 modules, which include 6 quizzes and 3 tests as well as OJT incorporated throughout the training program. The class will also take field trips to various locations on the system to observe the equipment being discussed at that time of the training program.

<u>MODULE #</u>	<u>NAME</u>	<u>DAYS</u>
1-T1444	Introduction to Distribution Dispatch	2
2-T1445	Numbering and Phase Designation	2
	Quiz # 1	1
3-T1446	Introduction to OH Systems	2
4- T1446	Introduction to UG Systems	2
	Quiz 2	1
5-T1447	Reading DSS line and network prints and follow sheets.	3
	Quiz #3/Review Modules 1-5	1
	Study Time Test #1	1
	OJT with Dispatch Supervisor	20
6-T1449	Reading secondary prints / OJT	2
	Field trip (Underground School)	1
7-T1445	Abnormal voltage calls	2
8-T1452	Introduction to distribution switching	5
9-T1453	Office automation	30
	Quiz #4	1
	OJT with Dispatch Supervisor	20
10-T1455	Cambridge	4
	Field Trip (Cambridge Tour)	1
11-T1461	4KV Underground Trouble Dispatching	5
	Quiz #5	1
	Review modules 6-11	1
	Study time/Test #2	1
12-T1456	4kV OH Trouble Dispatching	3
13-T1457	14kV OH Trouble Dispatching	3
	Field trip (substation)	1
14	14KV Underground Trouble Dispatching	4
	Quiz #6	1
	Field trip (Overhead School)	1

15-T1460	Permit switching and system changes	3
	Review Course	2
	Study Time/Test #3	1
	Final Oral/Written Exam	1

Throughout the entire training program, the following operating procedures, work methods and standards are reviewed:

W5001
2.11-1.1
1.4-1.1
WP401
WP404
WP406
2.7-2.1
2.7-2.2
2.4-3.2
OP317
TI400
TI445 & 445A
TI600

Numbering and phase designation sheet (s/word6.0/whc/proc)
Secondary network plan of restoration

Also, the following tapes are reviewed as well as the accompanying student workbooks:

L&K International Training Series
Distribution System Training

DST-8004 Three Phase Power Systems
DST-8005 System Layout
DST-8007 Underground Distribution Systems
DST-8008 Substations
DST-8010 Substation Transformers
DST-8012 Fault Interrupting Devices
DST-8013 Non-Fault Interrupting Devices
DST-8014 Voltage Control Devices
DST-8015 Relays Electro-Magnetic and Solid State
DST-8017 Differential Relays
DST-8018 Relay Coordination

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM	
Module 1: TITLE – Introduction to Distribution Dispatch		Time: 2 days	
Objectives: The trainee will: 1. Understand the training program goals 2. Be familiar with the tasks, responsibilities and demands required of an dispatcher 3. Be introduced to system design and equipment. 4. Be introduced to good communication skills			
INSTRUCTIONAL PLAN		MATERIALS	
Introduction 1. Go over course outline, explaining how the course structure and topics related to dispatch tasks and skill/knowledge requirements. Discuss course goals B. Discuss trainees requirements to pass 2. Discuss the tasks involved in the dispatchers job 50%: A. Reading prints and secondary sheets (cad) B. Switching and tagging circuits. C. Introduce OMS/GATOR/FATVIEW D. Interaction with field personnel (giving instructions, Etc.) E. Delivering timely information 3. Discuss the attributes (with example) required to become a good dispatcher: A. Confidence along with good interpersonal Communication skills. REVIEW TAPE #8020 Explain that the more familiar you become with field equipment the easier the switching procedures will become. Discuss in general NSTAR ELECTRIC TAGGING PROCEDURE. Stress that safety is the most important part of the dispatcher's job. B. Discuss the importance of good work habits. 1. Listening/hearing 2. attention to detail 3. note taking/shorthand 4. asking the right questions 5. REVIEW TAPES		Dispatch Agreement TAPE #8005 TAPE #8020 TAPE #8037 TAPE #8039 TOUR OF EMC TRANSPARENCIES 4KV RADIAL CIRCUIT, PNU CIRCUITS TRAINING CLASS ROOM Intro to Dispatch Power Point Geographic map of NSTAR North EMS/SOCD Proc. 1224 Beco. 1.2-1AA Beco. TIB 405 NSTAR W-6754 Instruction for operation of the electric system	

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM	
Module 2: Numbering and phase designation of Transmission Lines, 			

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM	
Module 3: Introduction to the Overhead System		Time: 2 DAYS	
Objectives The trainee will: 1. Recognize and associate the equipment symbols with the OH equipment they represent. 2. Understand the purpose and function of primary and secondary equipment. 3. Understand the importance and purpose of switching devices.			
INSTRUCTIONAL PLAN		MATERIALS	
1. Briefly introduce the OH operating environments (compare/contrast types of equipment; types of field personnel; relative frequency/complexity of jobs in the two areas). Stress the importance of using correct terminology at all times. 2. Present and describe, in general, the various types of equipment encountered in distribution dispatching, giving examples of equipment in each category (both primary and secondary) 3. Use a symbol sheet to identify and describe OH equipment. A. Note the symbol and describe the purpose and function of each piece of equipment. B. Quiz students on recognition of the symbols. 4. Use OH 13.8kV and 4kV prints to explain the operating characteristics of related equipment.		NSTAR SAFETY Manual Section #6 TAPE 8006 Overhead Pictorial Circuit prints	

NSTAR ELECTRIC TECHNICAL TRAINING	DISTRIBUTION DISPATCH TRAINING PROGRAM	
Module 4: Introduction to the Underground System		Time: 2 DAYS
Objectives The trainee will: <ol style="list-style-type: none"> 1. Recognize and associate the equipment symbols with the UG equipment they represent. 2. Understand the purpose and function of primary and secondary equipment. 3. Understand the importance and purpose of switching devices. 		
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Briefly introduce the UG operating environments (compare/contrast types of equipment; types of field personnel; relative frequency/complexity of jobs in the two areas). Stress the importance of using correct terminology at all times. 2. Present and describe, in general, the various types of equipment encountered in distribution dispatching, giving examples of equipment in each category (both primary and secondary) 3. Use a symbol sheet to identify and describe UG equipment,. <ol style="list-style-type: none"> A. Note the symbol and describe the purpose and function of each piece of equipment. B. Quiz students on recognition of the symbols. 4. Use OH 13.8kV and 4kV prints to explain the operating characteristics of related equipment. 5. Review Underground operating procedures 	MATERIALS <p> NSTAR SAFETY Manual Section #8 TAPE 8007 Symbol sheets Circuit prints Index of UG switch procedures: C3800 W4009 W4014 W4011 C4004 C4002 W4003 W4000 Wms2.11-2.3 Op211.-7c Cs2.12-3.6 C2018 C2012wms2.11-2.2 W5001 Wms2.11-5.2 </p>	

NSTAR ELECTRIC TECHNICAL TRAINING	DISTRIBUTION DISPATCH TRAINING PROGRAM
Module 5: Reading Circuit, Line, Network Feeder Prints, and Follow Sheets	Time 2 Days
Objectives: The Trainee will: <ol style="list-style-type: none"> 1. Be able to read 4kV and 13.8kV primary overhead and underground circuit prints. 2. Be able to read one line diagrams. 3. Be able to read aloud from a print, referring clearly and accurately to circuit and line numbers. 4. Be able to read a follow sheet in conjunction with primary print 	
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Review the different types of prints used in distribution dispatching (if students have already taken the system course, compare and contrast these prints with station prints used in system dispatching). 2. Using overhead transparencies with copies for students, explain how to read circuit prints, beginning with relatively simple prints and progressing to more difficult prints. 3. Using a sample of representative prints, practice reading them, reviewing symbols and equipment, phase marking and switching devices. <ol style="list-style-type: none"> A. Four 4kV underground prints B. Four 13.8kV overhead prints with one line diagrams C. Four combination overhead and underground prints 4. Have students conduct a "talking tour" of circuit prints, reading them out loud to practice. <ol style="list-style-type: none"> A. Accurately referring to circuit numbers B. Finding and identifying equipment C. Reading one line diagrams <ol style="list-style-type: none"> 1. Explain the relationship between primary prints and follow sheets. 2. Explain how to read follow sheets with primary prints. 	MATERIALS <p> Tape 8012 Tape 8013 Transparency, handout of prints, one line diagrams Follow sheets Print symbols </p>

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM
Module 6: Reading Secondary Prints		Time: 2 days
<p>THE TRAINEE WILL:</p> <ol style="list-style-type: none"> 1. Be able to read secondary overhead and underground radial prints. 2. Understand the symbols while reading secondary radial prints. 3. Be able to bring secondary view and navigate cad computer 4. Be able to read AC network secondary Sheets. 5. Be able to recognize A.C. network secondary symbols. 6. Understand A.C. network secondary phase markings. 		
<p>INSTRUCTIONAL PLAN</p> <ol style="list-style-type: none"> 1. Introduce secondary overhead and underground radial prints, and describe how they differ from prints covered in previous lessons. 2. Using a secondary print, explain secondary radial symbols. 3. Introduce and describe the split fiber main system. 4. Explain how to read secondary radial prints 5. Explain how to use secondary prints with primary prints. 6. Have students practice reading secondary prints and secondary prints in conjunction with primary prints. 7. Introduce ACN secondary prints and describe how they differ from prints covered in previous lessons. 8. Using an A.C. network secondary print, explain A.C. network secondary symbols. 9. Explain A.C. network secondary phase markings. 10. Explain how to read A.C. network secondary prints and have the students practice reading them. 11. While using A.C. network secondary prints, have the students isolate various secondary faults. (e.g., manhole troubles, faulted cables between manholes, blown limiters, etc.) 		<p>MATERIALS</p> <p>Secondary Prints, Primary Prints</p> <p>ACN Secondary Prints</p> <p>Tape DSO5.1 OH Tape DSO5.2 UG</p>

NSTAR ELECTRIC TECHNICAL TRAINING	DISTRIBUTION DISPATCH TRAINING PROGRAM
Module 7: Abnormal Voltage Calls	Time: 2 days
Objectives: The trainee will: <ol style="list-style-type: none"> 1. Be able to chase low voltage calls in the overhead. 2. Understand the purpose and function of overhead equipment that controls the voltage of circuits. 3. Be able to chase low voltage calls in the underground 3. Be able to document information for low voltage calls. 	
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Explain the various ways in which low voltage problems occur in the overhead. <ol style="list-style-type: none"> A. Loading of transformers B. Voltage drop caused by undersized secondary mains and services C. Loose electrical connections D. Neutral problems either on NSTAR or customer side E. Overloaded circuits or circuits off schedule 2. Explain how to use primary and secondary prints to investigate voltage problems. 3. Using prints, review and expand on the purpose and function of overhead equipment controlling circuit voltage. <ol style="list-style-type: none"> A. Regulators - maintain voltage B. Stepdown transformers - maintain voltage in 4kV loading conditions. C. Capacitors - maintain voltage by correcting power factor. 4. Explain the procedures to locate low voltage problems, including how to use the white card when communicating with field personnel. <ol style="list-style-type: none"> A. Check voltage at house B. Check voltage at adjacent house in the same network C. Check voltage and load at feed transformer <p>Additional equipment to check if necessary</p> <ol style="list-style-type: none"> A. Regulators B. Stepdowns C. Capacitors D. Station Equipment 5. Introduce low voltage problems in the underground, briefly comparing them to overhead problems discussed in the previous module (e.g, frequency of OH vs. UG voltage problems, complexity of jobs, relative danger, etc.). 6. Explain how low voltage problems occur in the underground. <ol style="list-style-type: none"> A. Loading of transformers 	MATERIALS <p>Primary Prints Secondary Prints O.P. 1.3-3B W5113 Voltage charts Fusing charts Tape 8011 Tape 8014 Com ELEC OH Constr. Standard Beco. 2.12-5.1</p>

NSTAR ELECTRIC TECHNICAL TRAINING	DISTRIBUTION DISPATCH TRAINING PROGRAM	
Module 8: INTRODUCTION TO DISTRIBUTION SWITCHING		Time: 5 DAYS
<p>Objectives: The trainee will:</p> <ol style="list-style-type: none"> 1. Be familiar with basic principles and procedures of distribution side switching and tagging. 2. Be familiar with the relevant Operating Procedures and 3. Understand RAD-SEC switching. 4. Understand the functionality of the asu switches 		
<p>INSTRUCTIONAL PLAN</p> <ol style="list-style-type: none"> 1. Introduce and discuss, in general, distribution-side, switching, review switching circumstances, permit, trouble, short circuits, equipment involved; compare and contrast system and distribution switching; review the "hierarchy" of considerations (personnel safety, equipment, outage); overall safety considerations. 2. Review switching devices. 3. Introduce and explain, in general, the various types of switching procedures (refer as appropriate to the relevant procedural documents). <ol style="list-style-type: none"> A. Opening and closing switching devices B. Permit switching C. RAD-SEC switching (routine and trouble) D. ASU SWITCH operations D. Padmount oil switching E. Fault locating 4. Discuss tagging and go over, in general, defining each of the major types of tags and the circumstances of their use. <ol style="list-style-type: none"> A. Master Work Tag B. TEST C. Do Not Operate Tag D. GROUND 5. Explain organization and sequence of subsequent modules covering distribution switching tasks, noting that specific procedures will be covered in detail for each type of switching tasks. 	<p>MATERIALS</p> <p>W-5000 W-5001</p> <p>NSTAR TAGGING PROCEDURE Section 9 Power point Tagging control sheet Prints NSTAR Tags Beco op 20.3</p>	

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM	
Module 9: OFFICE AUTOMATION		Time: 30 DAYS	
OBJECTIVE: THE TRAINEE WILL <ol style="list-style-type: none"> 1. OPERATE A NETWORKED PC TERMINAL 2. OPERATE THE SCADA SYSTEM 3. OPERATE THE OMS SYSTEM 4. OPERATE GATOR SYSTEM 5. OPERATE FASTVIEW 6. OPERATE THE AVTEC COMMUNICATION SYSTEM 			
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Outside vendor support for basic computer operation 2. Review EMS Manual (SCADA) <ol style="list-style-type: none"> a. Log in to SCADA b. Navigate c. Open GDB's and alarm browsers d. Set up AOJ's e. Practice with the BOA menus f. Review RADSEC screens g. Review reclosing schemes and protection areas h. Compare Screens with paper prints i. Review alarm conditions j. Actions to take during outage 3. Review OMS training manual 4. Review GATOR training manual 5. Attend Fastview training session 6. Review AVTC manual 		MATERIALS PC's SCADA SIMULATOR and manual OMS/GATOR Training and manual Fastview training and manual Tape 8021 Tape 8022 AVTEC Manual	

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM	
Module 10: CAMBRIDGE TRAINING		Time: 5 DAYS	
INSTRUCTIONAL PLAN		MATERIALS	
COVER THE MATERIAL IN ALL 14 CAMBRIDGE MODULES EMPHASIZING MOD'S 4, 6, 9, & 11		CAMBRIDGE TRAINING MODULES Power point presentation intro KEMA voltage control Network overview KEMA Abnormal condition procedures Voltage control pages on SCADA Prints & follow sheet books	

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM
Module 11: 4KV UG. TROUBLE AND S/C		Time 4 Days
<p>Objectives: The trainee will:</p> <ol style="list-style-type: none"> 1. Determine outage from OMS training simulator 2. Be able to dispatch personnel appropriately to locate 4kV underground trouble and correct trouble. 3. Be able to write switching and tagging orders for 4kV underground trouble 4. Update OMS/GATOR from results of dispatch work 		
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Introduce underground trouble switching. 2. Using an underground 4kV circuit print, explain how to gather the necessary information, dispatch troublemen, switch, tag an underground trouble job. 3. Have trainees practice the process on the following trouble jobs: <ol style="list-style-type: none"> A. Faulted underground transformers <ol style="list-style-type: none"> 1. How to isolate and clear 2. Start load by replacing or temp generator B. Faulted Section <ol style="list-style-type: none"> 1. How to isolate pick up load and clear 2. If all load started and need outage refer for permit C. Faulted oil switches <ol style="list-style-type: none"> 1. How to isolate pick up load and clear 2. If all load started and need outage refer for permit 		MATERIALS <p>OMS/GATOR simulator Prints Tagging cards Switching sheets</p>

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM
Module 12: 4KV O.H. TROUBLE AND S/C		Time 4 Days
<p>Objectives: The trainee will:</p> <ol style="list-style-type: none"> 1. Determine outage from OMS Straining simulator 2. Be able to dispatch personnel appropriately to clear 4kV overhead trouble and/or start load. 3. Be able to write switching and tagging orders for 4kV overhead trouble 4. Update OMS/GATOR from results of dispatch work 		
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Introduce overhead trouble switching, briefly noting similarities and differences from underground trouble jobs. 2. Using an overhead 4kV circuit print, explain how to gather the necessary information, dispatch troublemen, switch for a typical overhead trouble job. 3. Have trainees practice the process on the following trouble jobs: <ol style="list-style-type: none"> A. Faulted overhead transformers <ol style="list-style-type: none"> 1. How to clear from line 2. Start load by replacing or jumpering breakers B. Faulted cutout <ol style="list-style-type: none"> 1. How to clear from line 2. Start load by replacing or jumpering C. Faulted solid disconnects <ol style="list-style-type: none"> 1. How to clear the disconnects from line 2. How to replace the disconnects or switch the circuits D. Faulted LA's (clear from line) E. Faulted section of primary wire F. Overhead street lighting (clear from line and make safe) G. Primary fuse blown <ol style="list-style-type: none"> 1. Find fault if possible 2. Refuse 3. Review fusing schedule 		MATERIALS <p>OMS/GATOR simulator Prints</p>

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM	
Module 13: 14KV OVERHEAD TROUBLE & SHORT CIRCUITS			Time: Day
<p>Objectives: The trainee will:</p> <ol style="list-style-type: none"> 1. Determine outage from OMS Straining simulator 2. Be able to dispatch personnel appropriately to clear 4kV overhead trouble and/or start load. 3. Be able to write switching and tagging orders for 4kV overhead trouble 4. Update OMS/GATOR from results of dispatch work 			
INSTRUCTIONAL PLAN			MATERIALS
<ol style="list-style-type: none"> 1. Introduce 13.8kV overhead trouble switching and discuss in general how 13.8kV trouble jobs compare to 4kV trouble covered in the previous module. 2. Using an overhead 14kV circuit print, explain how to gather the necessary information, dispatch troublemen, switch, & tag 3. Have trainees practice the process on the following trouble jobs: <ol style="list-style-type: none"> A. Faulted overhead transformers <ol style="list-style-type: none"> 1. How to clear from line 2. Start load by replacing or jumpering breakers B. Faulted cutout <ol style="list-style-type: none"> 1. How to clear from line 2. Start load by replacing or jumpering C. Faulted solid disconnects <ol style="list-style-type: none"> 1. How to clear the disconnects from line 2. How to replace the disconnects or switch the circuits D. Faulted LA's (clear from line) E. Primary fuse blown <ol style="list-style-type: none"> 1. Find fault if possible 2. Refuse 3. Review fusing schedule F. Faulted section of primary wire 			<p>OMS/GATOR simulator Prints</p>

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM
Module 14: 14KV UNDERGROUND SHORT CIRCUITS		Time: 3 Days
<p>Objectives: The trainee will:</p> <ol style="list-style-type: none"> 1. Understand 14kV underground short circuits. 2. Be able to dispatch personnel to respond to underground short circuits. 3. Be able to write and tag on 14kV short circuits. 4. Be able to use follow sheets to locate a fault. 5. Be able to write switching and tagging orders for 14kV underground short circuits 		
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Introduce and briefly describe 14kV underground short circuit problems. 2. Using the primary prints, explain where to dispatch personnel when a short circuit occurs on an underground 14kV circuit. (Note that the more help, the easier it is to get the job done and that any of the following can be called in: Station personnel, Troublemens, Inspectors, Splicers, Pump team, Supervisors). 3. Using the primary print, role play with trainees a fault in the feeder section. <ol style="list-style-type: none"> A. Reported manhole trouble. B. Switch, tag and start all load. E. Mark prints off schedule. F. Update OMS & Gator 4. Using the primary print, role play with trainees a fault between switching station padmounts <ol style="list-style-type: none"> A. Reported manhole trouble. B. Dispatch personnel to locate a fault . C. Using information from field personnel, place fault using primary print and follow sheet and test equipment D. Determine repairs. E. Update OMS/GATOR 		MATERIALS <p>OMS/GATOR Underground circuit prints and follow sheet, transparency,</p>

NSTAR ELECTRIC TECHNICAL TRAINING		DISTRIBUTION DISPATCH TRAINING PROGRAM
Module 15: Permits & System Changes		Time: 3 Days
<p>Objectives: The trainee will:</p> <ol style="list-style-type: none"> 1. Understand the permit system & system change forms. 2. Be able to review a permit for all correct information and switching 3. Be able to Switch in and out a permit 4. Be able perform and document a system change 		
INSTRUCTIONAL PLAN <ol style="list-style-type: none"> 1. Review NSTAR safety manual section 9 regarding permit work and system changes 2. Review w-5005 3. Using the primary print, and old permit review the steps that are needed to complete a distribution permit 4. Using the primary print and an old permit, role play with trainees and have them perform all steps needed to complete a distribution permit <ol style="list-style-type: none"> A. Reported manhole trouble. B. Dispatch personnel to locate a fault . C. Using information from field personnel, place fault using primary print and follow sheet and test equipment D. Determine repairs. E. Update OMS/GATOR 5. Using a previously switched permit have trainees <ol style="list-style-type: none"> A. Review switching against prints B. Review return switching C. Role play switching out permit granting clearance releasing clearance return switch and make system changes according to the permit 		MATERIALS <p>Circuit prints Permit form System change forms W5005 NSTAR safety manual SECTION 9 9.9 & 9.10</p>

Record Request DTE-8 (Tr. 2, at 381)

Please discuss what specific training requirements, if any, should be considered by the Department for in-house employees and contractors that work on electric and/or gas distribution systems.

Response

As evidenced by the comprehensive training requirements currently in place at NSTAR Electric and NSTAR Gas (see Company response to Record Request DTE-7), the Company does not advocate the Department adopting the recommendations of the IBEW in this proceeding relating to alternative training and certification processes. Moreover, it is unnecessary to do so. The participants at the Department's September 9 Technical Session were unable to present the Department with any evidence of substantive gaps in the training structure currently employed by the electric and gas companies. Accordingly, the Department should not adopt the recommendations of the IBEW.

Record Request DTE-10 (Tr. 2, at 447)

Please provide your company's distribution system losses at the time of the entire system's peak, at various voltage levels including the lowest possible voltage level for which you have relevant data.

Response

Please refer to Attachment DTE-RR-10 which sets forth NSTAR Electric's peak losses. Page 1 of the attachment reflects load losses that result from NSTAR Electric's load flow analysis calculated for each voltage level from 345kV transmission down through the secondary side of bulk distribution transformers. The load flow analysis models NSTAR Electric's forecasted 2006 summer peak as reported in FERC Form #715 submitted in April 2005. NSTAR Electric also provides no-load losses for its bulk transmission and distribution transformers on page 2 of the attachment.

The Company notes that its distribution lines and line transformers are not modeled in the load flow analysis. The losses reported on the attachments constitute approximately 25% of total peak losses on its system. The remainder of the losses arise from load and no-load losses on the distribution lines and transformers that are not modeled in the cases reported in FERC Form #715.

NSTAR ELECTRIC

TRANSMISSION SYSTEM LINE LOSSES (LOAD LOSSES)

LOSSES ASSOCIATED WITH NSTAR PORTION OF ISO-NE 345/230/115KV TRANSMISSION SYSTEM MODELED
IN FERC FORM 715 CASES

LOAD LOSSES ASSOCIATED WITH NSTAR BULK SUBSTATION TRANSFORMERS MODELED IN FERC FORM 715 CASE

COMPANY

2006 SUMMER PEAK

	TOTAL LOAD* (MW)	STATION LOAD** (MW)	LOSS (MW)	LOSS PERCENT ****
NSTAR TOTAL	4,851.7	4,774.5	77.2	1.6%
345 KV			13.5	17.5%
230 KV			4.5	5.9%
115 KV			50.7	65.7%
BELOW 115KV***			8.4	10.9%
BOSTON EDISON	3,473.3	3,422.1	51.2	1.5%
345 KV			11.7	22.9%
230 KV			4.5	8.9%
115 KV			31.7	61.9%
BELOW 115KV			3.2	6.3%
COMMONWEALTH ELECTRIC	1,014.3	990.5	23.8	2.3%
345 KV			1.8	7.6%
230 KV			0.0	0.0%
115 KV			17.3	72.8%
BELOW 115KV			4.7	19.6%
CAMBRIDGE ELECTRIC LIGHT	364.2	361.9	2.3	0.6%
345 KV			0.0	0.0%
230 KV			0.0	0.0%
115 KV			1.7	75.2%
BELOW 115KV			0.5	22.6%

* Total Operating Company Load Including Losses

** Sum of Substation Loads by Company Excluding Losses

** Includes all distribution voltages that may be modeled in FERC cases, including 34.5kV, 23kV, 13.8kV, and 13.2kV

**** Percentage by Company is loss fraction to total load. Percentage by voltage level is loss fraction to total losses

Record Request DTE-12 (Tr. 2, at 454)

Does your (gas) company have a policy requiring independent audits of pipe leaks on your company's gas distribution system?

Response

NSTAR Gas Company classifies and repairs leaks consistent with federal pipeline regulations (49 C.F.R. 192) and internal operating and maintenance procedures. Moreover, the Department of Telecommunications and Energy provides comprehensive oversight of the Company's gas distribution system through its Pipeline Safety Division.

Leaks are classified as either Class 1, 2, or 3, based on whether the leaks require immediate attention or monitoring. The Company actively manages detected leaks by either eliminating them or performing periodic monitoring. In that regard, all leaks that pose a hazard to public safety are classified as Class I. Immediate and continuous action is taken until the Class I leak is repaired or until the hazard no longer exists. All non-hazardous leaks are classified as Class II or Class III leaks, depending on the nature of the leak. Although not determined to be hazardous, Class II leaks are monitored and scheduled for repair as necessary. The majority of Class II leaks are repaired within a few days and those not repaired in a few days are monitored and repaired on a routine basis. Some Class III leaks are repaired, but the majority are recorded and reevaluated during regularly scheduled leak surveys.

Given the pervasiveness of federal and state regulatory oversight over the Company, particularly in the area of gas leak data, the Company has not found it necessary to require an independent audit of its gas leak data. The Company has in the past, and will continue in the future, to hire independent consultants to review issues associated with its distribution system where the circumstances of a particular situation warrant an in-depth analysis by an independent party.